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PALMÆ MALESICÆ

VIII.—THE GENUS *LICUALA* IN THE MALAY PENINSULA

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1. Introduction

The results embodied in this paper are of a study undertaken with the view of arranging systematically the Singapore herbarium specimens of the *Licuala* species indigenous in the Malay Peninsula. The present world conditions, entailing the cessation of intercourse with certain botanical institutions, the dislocation of the staff at some others, and the risks to parcels during transit across oceans have precluded my obtaining either critical notes of the type specimens preserved outside the Malay Peninsula, or a loan of the specimens themselves. Under such limitations the results of my undertaking would have been of little systematic value but for the valuable assistance derived from BECCARI'S monographic work on the genus published first in an abbreviated form in *Webbia* V, 1921, pp. 22-55, as a part of *Recensione delle Palme del Vecchio Mondo Appartenenti alla Tribù delle Corypheae* and then in an extended form in the *Annals of the Royal Botanic Gardens, Calcutta*, XIII, printed in 1931 and published in 1933 (cited

below as *Calcutta Annals* or *Calc. Annals* XIII, 1933). In this latter work BECCARI incorporated the results of the opportunities he had not only of consulting the type material of most of the species he studied and of comparing newer material with it, but also of making lengthy critical descriptions, analytical drawings and photographic plates of such specimens.

2. Hints to Collectors

Licuala is a genus of small palms the largest of which attain about 15-20 feet in height and a few (± 3) inches in stem diameter. However, most of the species are almost stemless or only a few feet in height. Compared therefore with the long, thorny rattans or tall giants like *Corypha*, *Borassus* and *Oncosperma*, the *Licuala* species present very few obstacles to the collector making good herbarium specimens. The tallest ones can be cut down with an ordinary jungle knife within a few minutes, and the specimens of leaves and of spadices with flowers and fruits do not form very weighty or bulky specimens. Though the petioles of most species are provided with thorns, yet the specimens are easily handled even without leather gloves, which are required in handling specimens of Rattans or *Oncosperma*. Hence one would have expected this genus to be well represented in most herbaria, and also to be specifically well known in areas botanically fairly well explored. From the study of the species in the Singapore herbarium and from the notes given by BECCARI, I conclude that this is far from the case. This country has been explored botanically for the last fifty years or more by different botanical collectors and I find the *Licuala* species are very badly represented in the herbarium. Even in regions botanically well known, species formerly not recorded are being discovered. The principal reason for this is that in the field most of the species look alike and are not easily distinguished one from another except when the collector has made a special point to study them in the field. The number of segments present on a leaf often depends on the age of the plant and to a certain extent on the conditions under which it grows. Many times really acaulescent species may be mistaken for others which flower and fruit when quite small or stemless. In many species, moreover, the flowers and fruits remain hidden among the leaves so that they may be passed as the sterile stages of others.

If the collector is therefore to see that he does not miss any uncommon species he meets with in the jungle, he must learn to distinguish the species in the field. To

do this satisfactorily the following pointers may be useful:—

1. The average number of main nerves (costae) radiating from the apex of the petiole is a more stable character than the average number of leaflets into which a leaf is divided, though the latter is sometimes useful in the identification of a species.
2. Some species have always undivided leaves (not noticed in any species wild in the Peninsula).
3. In some species the median segment of the leaf is three or more times as broad as the other lobes, in others the segment is nearly as broad as the other segments.
4. In some species the broad median segment is entire, in others it is divided half-way.
5. In some species the middle segment becomes distinctly petiolulate, in others it is always sessile.
6. In some species the lateral margins of the leaf segments are arcuately cuneate, in others the margins are straight.
7. Some species are always solitary, others form tufts.
8. Some are always stemless, others produce stems though they may begin to flower when stemless.
9. In some species the spadices reach high above the height of the leaves so as to become visible from a distance; in others the spadices remain hidden among the leaves.
10. In some species the spadices are simple, terminating with one or more floriferous branchlets (spikelets); in others the spadices are compound.
11. In some species the lower branches of the compound spadices are subdivided into 10 or more spreading spikelets; in some others the branches contain only 2–5, usually digitate, branchlets; in still others the branches are simple, undivided.
12. Different species are characterised by different colour of spadices, flowers and fruits.
13. In some the fruits are 3–4 times as long as they are thick; in others the fruits are globose.

In a given field, all Licualas may have many of the above-mentioned characters in common, but they will differ in others, which, though a few, will suffice to distinguish

between the species, even disregarding such variable characters as the height of the plant, and the nervation and the number of the leaf-segments. But it is desirable to record in the field notes as many particulars as possible concerning the habit, stem height (without leaves), etc., of the plants, size of the petioles, leaf-lamina and spadix, the average number of segments to a leaf, the average number of main branches to a spadix, the colour of fruits, flowers, etc.

For herbarium purposes the leaf specimens should be taken from flower-bearing crowns; and if there is some variation in size, etc., in the leaves of non-flowering crowns, some few specimens may be made to indicate this variation. Care, however, should be taken to use appropriate tags so that the leaves may be sorted and mounted in the herbarium according to their status without any fear of confusion (*vide* my remarks on numbering the specimens in the field in *Gard. Bull., Straits Settl.* IX, 1937 p. 155, 286-287, and 303 in example).

If it is desired to reduce the bulk of the specimens one may split the leaves longitudinally, taking care to leave the middle segment intact; the half without median segment becomes practically useless, unless the species is rare and a sufficient number of leaves is not available for making up the sets.

3. Subgenera and Sections

Apart from the collector's difficulties, the genus *Licuala* presents many difficulties to a systematist. There is a good deal of variation in the vegetative parts of the plants. Though the branching of the spadices frequently occurs in a definite manner and forms a useful character to differentiate between species, it is not one that can be employed to subdivide the genus into subgenera or sections; such a classification not only places very closely related species in different sections or subgenera, but also divides subgenerically or sectionally polymorphic specific units.

BECCARI, who in 1886 had relied on the branching of spadices to divide the genus *Licuala* subgenerically into EU-LICUALA (implicit), LICUALOPSIS, LICUACELLA and LICUALINA (*Malesia* III, 1886, pp. 69-90), was obliged in 1921 to reduce these subdivisions to two, namely, EU-LICUALA and LICUACELLA, the latter to include LICUALOPSIS and LICUALINA (*Webbia*, V, 1921, pp. 22-55). Here BECCARI made also a new subgenus DAMMERA, but the main character used to define this subgenus is derived from the flower. This disposition has also been adopted in BECCARI'S monograph published in the *Calcutta Annals*, XIII (1933). Leaving the subgenus DAMMERA out of consideration for

the present, this modified subgeneric division of *Licuala* is still unsatisfactory, because the basis used to distinguish these two subgenera is still the character of the branching of the spadices. Under such a classification, for instance, *L. lanuginosa* and *L. Kingiana* fall into two subgenera, when the species are so very closely related that they may be regarded as two varieties of the same species. Further, this classification obliges one to split such variable species as *L. modesta* Becc. *sensu lato* into *L. modesta* Becc. *sensu stricto* and *L. Wrayi* Becc. according to the development of the spadix, and then to place these two species thus defined into two different subgenera.

The other grouping of the *Licuala* species is one published by DRUDE (ENGL. u. PRANTL, *Pflanzenf.* II, 3, 1887, p. 35), subsequently modified by RIDLEY. DRUDE was apparently unaware of the subgenera published by BECCARI, for, without making any reference to the latter's subgenera, DRUDE proposed independently two subgenera, namely: EU-LICUALA to include the species with a dorsal embryo, and PERICYCLA (Bl.) Drude (spelt by error *Pericyla*) to include the species with a basilar embryo. The type of this second subgenus was *L. penduliflora* (Bl.) Miq., published previously as *Pericycla penduliflora* Bl. It is apparent that, in reducing *Pericycla* Bl. to a subgenus of *Licuala*, DRUDE relied on the characters mentioned by BLUME, who had examined the position of the embryo in the flower only, where the position is often misleading. I point this out because I have not seen any species of *Licuala* having a basilar embryo, and BECCARI, who had opportunities to examine a very large collection of fruiting specimens, does not mention any such species.

In 1903 RIDLEY reduced *Pericycla* Bl. to a section of *Licuala*, defining it to include all species having a "panicled inflorescence" (*Journ. Roy. Asiat. Soc., Straits Settl.*, 41, 1903, p. 42). The section was naturally typified on *L. penduliflora*, of New Guinea, for which RIDLEY adopted the name *L. pericycla* Zipp. Mss.; but the only Malayan species that RIDLEY included in the section was *L. paniculata* Ridl., though *L. longipes*, *L. paludosa*, etc. have inflorescences similarly branched. RIDLEY adopted this section also in his later works, viz.: the *Materials for a Flora of the Malay Peninsula, Monocotyledons* (cited below as *Materials* or *Mat.*), II, 1907, pp. 159-165, and the *Flora of the Malay Peninsula* (cited below as *Flora*), V, 1925, pp. 24-30. But if, following RIDLEY's definition, one were to place all the species having "panicled inflorescences" in the section PERICYCLA, the group would consist of utterly unrelated species, several closely related species remaining outside.

In view of these drawbacks of previous definitions, an inquiry was made into the problem of subdividing the genus. The most stable characters were found to lie in the flowers, the nature of the divisions of the androecium affording characters to group the species into well defined subgenera. The utility of these characters was recognized by BECCARI (op. cit 1921 & 1933); but he employed them only in the analytical keys provided for the identification of the species, and not to define his subgenera. On the basis of these characters, I divide the genus *Licuala* into three subgenera, namely: LIBERICULA (new), EU-LICUALA and PERICYCLA. The second is further divided into four sections, but LICUACELLA is not retained.

I. LIBERICULA. Furtado subgen. nov.

Staminum filamenta 6 erecta aequalia, basi lata superne subulata, ad basin libera vel fere, nec in annulum prominentem ad corollæ faucem connata. Flores inter majores, circa 15 mm. longi, 5 mm. crassi.

Species unica, *L. peltata* Roxb., in regionibus humidis inter septentriones et orientem Indiarum spectantibus ex Assam, Khasia, Sikkim, etc. ad meridiem in Insulis Andamanicis, Tenasserim, et Thailandia (Siam) meridionali habitat.

II. EU-LICUALA Drude in Engl. u. Prantl, Pflanzenf. II, 3 (1887) 35; Ridl., Flora V (1925) 24 loco sectionis, nom. nud.

Licualopsis Becc., Malesia III (1886) 85.

Licualina Becc. op cit p. 88.

Licuacella Becc. op cit p. 86, in Webbia V (1921), 24 et 37, in Calc. Annals XIII (1933), 116 et 128. **Syn nov.**

Staminum filamenta 6, aequalia, erecta vel inflexa, ad corollæ faucem in annulum prominentem connata. Flores 3–8 mm. longi, 2 mm. crassi.

Sectio 1: WURMBIA Furtado sect. nov.

Annulus staminalis membranaceus, aut truncatus, apice in filamenta parva, erecta, filiformia productus, aut in filamenta erecta, lobiformia, abrupte subulata divisus. Antheræ haud aristatæ.

Inter divisiones *Licualae* hæc sectio species plurimas includens, qui in regionibus torridis et semi-torridis ex Birmania, Thailandia (Siam) et China meridionale ad Celebesiam et Novam Guineam habitant, maximæ species in regionibus malayanis (viz. in Peninsula Malayana, Sumatra et Borneo).

Species typica: *L. spinosa* Wurm.

Nomen hujus sectionis in honorem cl. F. VON WURMB, auctoris speciei typicæ.

Sectio 2: BONIA Furtado sect. nov.

Annulus staminalis brevis, crassus. Filamenta erectiuscula, lobiformia, elongata, subbulbosa, apicem in connectivum discoideum antherarum dorso adnatum, expansa. Antheræ haud aristatæ.

Species hujus sectionis adhuc unica (*L. fatua* Becc.) cognita, habitat in Indo-China. Nomen hujus sectionis in honorem Rev. Presb. BON, qui specimen typicum speciei in Tonkinia Occidentale legit.

Sectio 3: DAMMERA (Becc.) Furtado **stat. nov.**

Dammera Becc. in Webbia V (1921), 24 et 38 et in Calc. Annals XIII (1933) 116 et 130 (loco subgeneris).

Dammera K. Schum. et Laut, Fl. deutsch Schutzgeb. Sudsee (1900) 201 t. A-F et 2 (loco generis).

Annulus staminalis elevatus, crassus. Filamenta e basi valida superne attenuata et antherarum dorso proluxe adnata. Antheræ haud aristatæ. Species hujus sectionis duæ tantum cognitæ, ambæ in Nova Guinea habitant.

Species typica: *L. Beccariana* Furtado **nom. nov.**

Basinym: *L. ramosa* (K. Schum. et Laut) Becc. (1921), nec *L. ramosa* Bl.

Sectio 4: BECCARIA Furtado **sect. nov.**

Annulus staminalis brevis, crassus, conspicuus. Filamenta lobiformia, perlonga, subulata, apice bis inflexa (i.e. apice introflexa et rursus erecta), antheras apiculato-aristatos ferentia.

Species hujus sectionis adhuc unica (*L. reptans* Becc.) cognita in Borneo habitat.

Nomen hujus sectionis in honorem Cl. O. BECCARI, palmographi magni.

III. PERICYCLA (Bl) Drude in Engl. u. Prantl, Pflanzenf. II, 3 (1887) 35 (Sphalmate Pericyla).

Pericycla Bl., Rumphia II (1844) 47 t. 94 (loco generis).

Pericycla (Bl.) Ridl. in Journ. Roy. Asiat. Soc., Straits Settl. 41 (1903) 42, Mat. II (1907) 159 et Flora V (1925) 25—(loco sectionis; sphalmate *Pericyclus*).

Staminum filamenta 6, erecta, valde inæqualia, 3 ad loborum apicum majorum inserta, et 3 in sinibus vel ad loborum apicum minorum sita, ad corollæ faucem in annulum prominentem connata. Antheræ haud aristatæ. Flores inter minores.

Species hujus subgeneris paucae, omnes in regionibus oceaniis habitant; unica in Australia, alteræ in insulis

papuanesianis usque ad insulas Solomonenses, maximæ in Nova Guinea.

Species typica: *L. penduliflora* (Bl.) Miq. (= *Pericycla penduliflora* Bl.).

4. Analytical Key to the Species

- A. Flowers about 15 mm. or more long and 5 mm. or more across. Stamens 6, equal, free at the throat of the corolla, the staminal ring being almost obsolete (LIBERICULA). .. *L. peltata* Roxb.
- AA. Flowers about 3–8 mm. long and 2 mm. across. Stamens united at base into a conspicuous ring at the throat of the corolla .. (B).
- B. Staminal ring 3-lobed, lobes emarginate; 1 filament in the notch at the apex of each lobe and 1 in each sinus between the lobes. (PERICYCLA).
- (a) Leaf-blade entire. Partial inflorescences paniculately divided into 8–10 branchlets (spikelets) .. *L. grandis* Wendl. (cultivated).
- (aa) Leaf-blade multipar-
tite. Partial in-
florescences digi-
tately divided into
3–4 branchlets .. *L. Rumphii* Bl. (cultivated).
- BB. Staminal annulus ends in 6 almost equal lobes or filaments (EU-LICUALA) .. (1).
- 1A. Spadix simple, terminated by one or more floriferous spikelets .. (2).
- 1B. Spadix branched into two or more partial inflorescences, each internode sheathed by a separate spathe .. (4).
- 2A. Spadix terminated by one or two spikelets .. (3).

- 2B. Spadix terminated by many
floriferous spikelets (some-
times a short liguliform
spathe intervening) .. *L. modesta* Becc.
(partly).
- 3A. Spadix axis and flower-buds
covered with long coarse
hairs. Calyx striate, split-
ting into many longitudinal
fibres. Leaf divided into
5-8 segments .. *L. Kingiana* Becc.
- 3B. Spadix axis and flower-buds
covered with minute hairs,
Calyx membranous, not
dissolving into fibres. Leaf
segments 12-15 .. *L. Scortechinii* Becc.
- 4A. Partial inflorescences un-
branched (*i.e.* consisting of
solitary spikelets) .. (5).
- 4B. Partial inflorescences
branched .. (14).
- 5A. Flowers distinctly pedicelled.
Calyx turbinate or nar-
rowed into a long pedicelli-
form base .. (6).
- 5B. Flowers not distinctly
pedicelled. Calyx cylin-
drical or campanulate .. (8).
- 6A. Spikelets distinctly hairy.
Calyx hairy, or, if
deciduously hairy, the
corolla is distinctly hairy (7),
- 6B. Spikelets and calyx not hairy,
but covered with fugaceous
rusty-brown scales. Corolla
glabrous .. *L. Moyseyi* Furtado
- 7A. Hairs on spikelets and calyx
long, coarse. Calyx nearly
as broad as long, membran-
ous, striate, turbinato-
campanulate, suddenly
ending in a short solid
cylindrical base, more or
less lobed at apex. Flowers
usually solitary .. *L. Kunstleri* Becc.
- 7B. Hairs on spikelets and calyx
fine. Calyx coriaceous, not
striate, cup-shaped, nar-

- rowed into a long (longer than the cup) pedicelliform base, obscurely denticulate at apex but not lobed or lacerate. Flowers in groups of 2-3 in some parts
- 8A. Calyx cyathiform-campanulate, deeply lobed .. (9).
- 8B. Calyx cylindrical, truncate or lobed at apex .. (11).
- 9A. Calyx covered with long coarse hairs, usually one carpel fertile. The lateral margins of leaflets nearly straight .. (10).
- 9B. Calyx covered with fine hairs which later fall off partly. Frequently two or three carpels fertile. Lateral margins of leaflets arched, so that leaflets are arcuately cuneate *L. kemamanensis* Furtado.
- 10A. Hairs tawny *L. acutifida* Mart. (partly).
- 10B. Hairs whitish *L. pusilla* Becc. (partly).
- 11A. Calyx ± 4 mm. long, densely tomentose, curvately cuneate at base, little lobed at apex *L. tiomanensis* Furtado.
- 11B. Calyx smaller, puberulous or glabrous, not curvately cuneate at base; truncate or deeply lobed at apex .. (12).
- 12A. Calyx conspicuously striate, glabrous, asymetrically lobed at apex, truncate, caudiculate at base .. *L. pahangensis* Furtado.
- 12B. Calyx puberulous or glabrous, but neither conspicuously striate nor caudiculate .. (13).
- 13A. Calyx apex almost truncate at first, then irregularly split *L. Ridleyana* Becc.
- 13B. Calyx deeply lobed *L. confusa* Furtado.

- 14A. Lower partial inflorescences paniculiform, composed of 10 or more scattered spikelets (=floriferous branchlets) (15).
- 14B. Lower partial inflorescences composed of 2-5, usually digitate, spikelets .. (17).
- 15A. Spikelets slender, somewhat flexuose. Flowers frequently in groups of 2, spirally, or in terminal parts subalternately, arranged. Calyx 5 mm. long, about twice as long as it is broad .. *L. longicalycata* Furtado.
- 15B. Spikelets stouter, not flexuose. Flowers pluriseriate, usually solitary. Calyx shorter, almost as long as broad (16).
- 16A. The spathes much inflated. Spadix flexuose. Calyx cylindrical, thick from the very beginning. Ovary villous in the upper part .. *L. longipes* Griff.
- 16B. Spathes not so inflated. Spadix not flexuose. Calyx campanulate, membranous at first. Ovary glabrous .. *L. paludosa* Griff.
- 17A. Calyx glabrous, not split or lobate, but denticulate at apex (18).
- 17B. Calyx otherwise (19).
- 18A. Leaf-lamina about 12"-16" in radius, divided into 12 or more, triangular, subequal segments *L. glabra*
- 18B. Leaf-lamina 8"-12" in radius, divided into 5-8, arcuately cuneate, unequal segments, median segment divided half-way *L. glabra* var. *selangorensis*.
- 19A. Flowers pedicellate .. *L. mirabilis*.
- 19B. Flowers not pedicellate .. (20).

- 20A. Spathes and spadix densely covered with dark fuscous ferruginous scurf, and the spikelets and calyces densely covered with similarly coloured hairs .. *L. ferruginea.*
- 20B. Scurf and hairs when present not similarly coloured and frequently not so thick .. (21).
- 21A. Calyx cylindric, truncate at first, slightly split later. Spadix and spikelets not covered with a thick coat of deciduous tomentum .. *L. malajana* Becc.
- 21B. Calyx campanulate, lobed, or, if apparently truncate in early phases, the spadix and spikelets covered with a thick coat of deciduous tomentum (22).
- 22A. Plants stemless, about 12"-18" long, smallest in the genus. Leaves the smallest in the genus, divided into 3-8, rarely more, segments. Spadix about 12"-15" long, with spikelets 1½"-2½" long .. (23).
- 22B. Plants and leaves larger, with more leaf segments. Spadix and spikelets usually longer (24).
- 23A. Flowers frequently in groups of 2-3, often more than one fertile carpel. Fruit narrow elongate, about 3-4 times as long as it is thick. Ovary glabrous. Median leaf-segment never petiolulate *L. Kiahii* Furtado.
- 23B. Flowers solitary, with only one fertile carpel. Fruit globose. Ovary hairy. Median segment frequently petiolulate *L. triphylla* Griff.

- 24A. Lower partial inflorescences usually bifid, the upper ones unbranched. Most of the leaflets nearly linear, about $\frac{3}{4}$ "–1½ inches in width (25).
- 24B. Lower partial inflorescences usually 3–5-branched. Leaflets in most cases broader and conspicuously triangular .. (26).
- 25A. Spikelets and calyces rusty-tomentose. Flowers pluri-seriate on a cylindrical spikelet *L. acutifida* Mart. (partly).
- 25B. Spikelets and calyces whitish-tomentose. Flowers arranged spirally on flexuose spikelets *L. pusilla* Becc. (partly).
- 26A. Spadix, spathes and spikelets covered in early stages with a thick coat of creamish deciduous woolly tomentum. Corolla densely sericeous. Flowers solitary *L. lanuginosa* Ridl.
- 26B. Tomentum, when present on spadix, spathes or spikelets, not thick, and minute. Flowers frequently in groups of 2–3, Corolla glabrous or minutely hairy (27).
- 27A. Leaflets about 12" long. Spadix at the most 2½ ft. long. Spikelets usually less than 6" long and the lower spadix branches about 6" or less apart. Fruit elliptic, about 10–13 mm. long, 6–8 mm. through .. *L. modesta* Becc. (partly).
- 27B. Leaflets 20" or more long. Spadix 6 ft. or more long, with lower branches 9–18 inches apart, each spikelet in lower branches being 9–15" long. Fruit globose, 6–8 mm. in diameter .. *L. spinosa* Wurm.

5. Systematic Notes

A. LIBERICULA Furtado.

Licuala peltata Roxb., Fl. Ind. II (1824) 179; Griff. in Calc. Journ. Nat. Hist. V (1845) 324, et Palms Brit. Ind. (1850) 120 t. 222; Hook. f., Fl. Brit. Ind. VI (1892) 430; Becc. in Webbia V (1921) 24 et 39, et in Calc. Annals XIII (1933) 131 t. 74.

MALAY PENINSULA: *Lower Siam*, Kantang (Haniff & Nur, 4720).

Distribution: In the monsoon forests of North East India, Burma, Andamans and Nicobars.

This species was not recorded previously in the Peninsula, where it occurs only in the northern-most parts which form the southern-most range of the distribution of the species. In cultivation it is grown in many gardens throughout the Peninsula. The species sometimes begins to flower before its leaves have started to divide into segments.

B. EU-LICUALA § *Wurmbia* Furtado.

1. *Licuala acutifida* Mart., Hist. Nat. Palm. III, ed. 1 (1842) 237, t. 135 III et IV; Griff. in Calc. Journ. Nat. Hist. V (1845) 237 et Palms Brit. Ind. (1850) 122 t. 222 A et B; Mart. op. cit. III, ed. 2 (1849) 236 et (1850) 318; Hook. f., Fl. Brit. Ind. VI (1892) 433; Ridl., Mat. II (1907) 163 pp.; Becc. in Webbia V (1921) 30 et 44; Ridl., Flora V (1925) 27 pp.; Becc. in Calc. Annals XIII (1933) 168.

MALAY PENINSULA: *Penang*, Tulloh Bahang (Curtis, 1010); Government Hill (Ridley and Curtis, 7906); Waterfall (Curtis in June 1890); Penang Hill (Ridley in July 1898).

This species is very near to *L. Kunstleri* and so far not known from outside Penang. RIDLEY referred here some specimens of *L. pusilla* Becc. LOBB 280 cited by BECCARI as from Singapore may have come from Penang, for LOBB frequently gave incorrect localities to his plants, and there are reasons to believe that the majority of the Malayan plants collected by LOBB were from Penang (*vide*, BURKILL, in *Gard. Bull. Straits Settl.* IV, 1927 p. 127).

CURTIS notes on his specimen numbered 1010 that this is not the palm that supplies the walking sticks known as the "Penang Lawyer".

2. *Licuala confusa* Furtado sp. nov. Fig. 1.

? *L. acutifida* Becc. var. *peninsularis* Becc. in Webbia V (1921) 30 et 44, et in Calc. Annals XIII (1933) 169 t. 10-II. *Syn. nov.*?

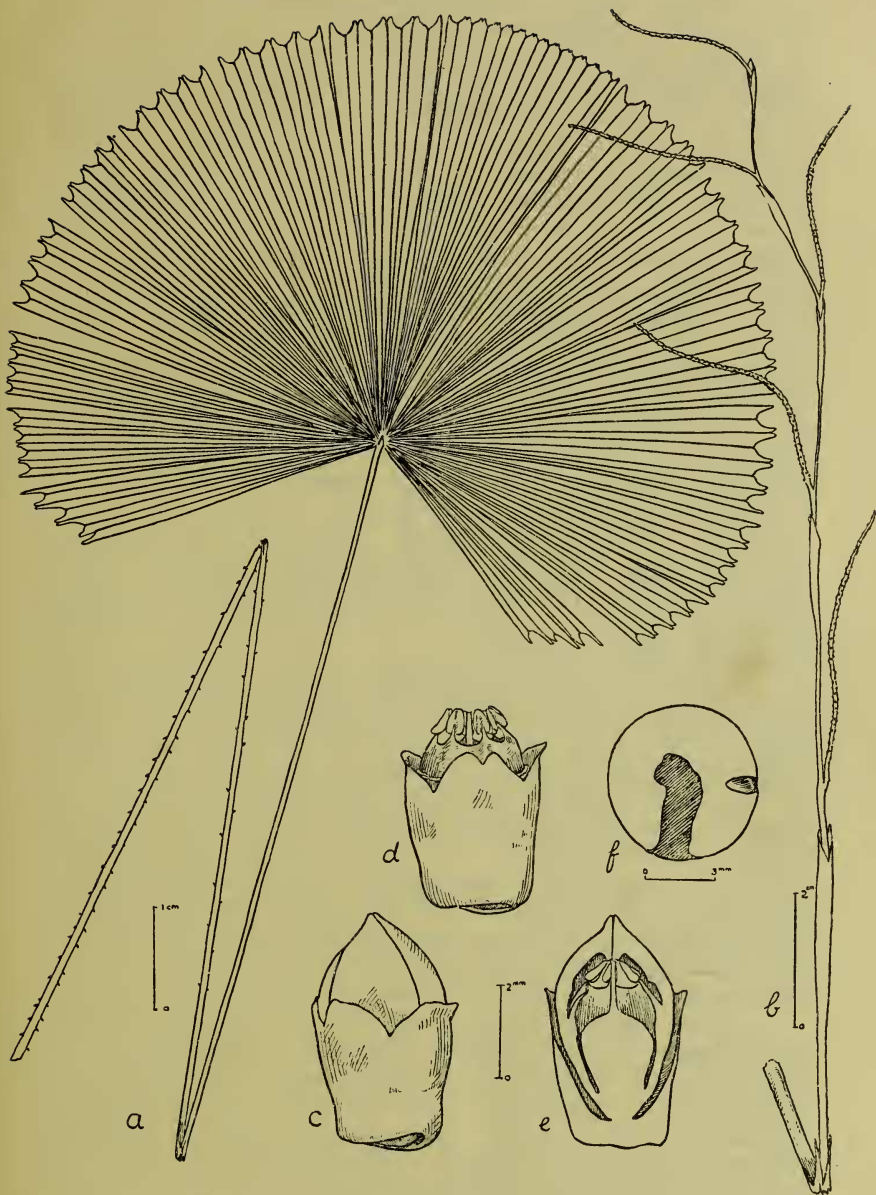


Fig. 1. *Licuala confusa* (Holotypus: FURTADO no. A).

a. Frons. b. Spadix. c. Alabastrum. d. Alabastrum, petala resecta, ut aestivatio staminum appareat. e. Alabastrum verticaliter discissum. f. Semen verticaliter discissum.

A *L. Ridleyana*, cui valde affinis, differt calyce conspicue lobato, apice nonnihil membranaceo.

Palma solitaria, acaulescens. *Petiolus* ultra 1 m. longus, interdum minor, ad medium aculeatus. *Segmenta* foliorum circa 17, subaequalia vel inaequalia, 2–4 costata, 34–45 cm. longa; medianum indivisum, interdum alteris multo latius, 6–12 costatum. *Spadix* petiolo brevior, in 4–5 partiales inflorescentias simplices, axi tomentosae divisus. *Flores* pluriseriatim dispositi, solitarii, plerumque super pulvinos prominulos interdum in depressionibus inserti. *Calyx* puberulus, cylindricus, basi truncatus, apice 3-lobatus, lobis rotundatis, saepe in 2 lobulos fissis, parum striatis, nonnihil membranaceis. *Corolla* calyce duplo longior, lobis acutis, puberulis vel non. *Annulus* staminalis in 6 filamenta antherifera abrupte subulata divisus. *Ovarium* glabrum. *Fructus* vivo rubrus, in sicco brunnescent, rugosus, circa 8 mm. in diam.; semen orbiculare 5 mm. in diam., gramineum, fossa integumentale cylindrica, ad centrum seminis cursa, apice parum curvata.

MALAY PENINSULA: *Perak*, Tapah Hill (Furtado sub litt. A, 11 June 1937–Holotypus); Tapah (Ridley, 14112); Bujong Malacca (Curtis in Dec. 1895 et in Aug. 1898). *Dindings*, Lumut (Ridley in Feb. 1892). *Selangor*, Semenyih (Hume, 7962).

RIDLEY 14112 is the haptoholotype of *L. Ridleyana* and in the capsules mounted on the sheet there are a few flowers which agree with the description and figure given by BECCARI for that species. But the vast majority of the flowers in the capsule and the flowers still attached to the spikelets are like the ones described here. Since I have typified *L. Ridleyana* on the characters of the flowers, I could not retain under that species RIDLEY 14112 from the Singapore herbarium. There are some minor variations between RIDLEY 14112 and the holotype of *L. confusa*. The Dindings specimens has no flowers and has been cited here because of its general resemblance to this species.

I have reduced here *L. acutifida* var *peninsularis* with some doubt. RIDLEY 9806 is cited as a paratype of the variety, but its duplicate in Singapore is *L. Ridleyana* as typified here. I have not been able to find in the Singapore herbarium any material which agrees exactly with the figures by BECCARI. RIDLEY 10329 from Lumut (the type collection is cited as 10239) bears calyces somewhat similar to the ones figured by BECCARI, but the partial inflorescences are branched in the Singapore specimen and the corolla is hairy. It seems to represent a variety of *L. spinosa*, typical material of which species is also mounted on the same sheet.

L. confusa has manifest affinities with *L. Ridleyana* but this has a truncate calyx which later splits irregularly. *L. pahangensis*, also an ally of *L. confusa*, has a glabrous, conspicuously striate calyx which bears a somewhat caudiculate base and less symmetrical lobes at the apex.

3. *Licuala Corneri* Furtado sp. nov. Fig. 2.

L. Kunstleri proxima, a qua calycibus basin versus pedicelliformiter longe productis truncatis, obscure denticulatis, sat distincta.

Palma solitaria ut videtur, cum caule 0.60–2 m. longo, 2–4 m. alta. *Petiolus* 35–100 cm. longus, prope basin tantum aculeatus, in medio circa 6–8 mm. et apice 4 mm. latus. *Segmenta* frondium subaequalia, circa 12–14, cuneatissima, 2–3, raro 1–4, costata, 25–35 cm. longa, apice 3–4.5 cm. lata; mediana alteris latiora, apice dentibus brevissimis. *Spadices* compositi, 35–80 cm. longi, in dimidia parte basali haud ramosi, cum 2–3 spathis involuti, in altera parte terminali in ramos simplices, florigeros, plerumque 3–4, ad 15 cm. usque longos, dense pubescentes, divisi. *Spathae* basales bicarinatae, alterae tubulares, punctis fugaceo fusco-leprosis tectae, apice marcescentes. *Flores* geminati vel interdum solitarii, pedicellati, in alabastro fusiformes, 5–8 mm. longi. *Calyx* dense pilosus, 4 mm. longus, apice truncatus, obscure 3-denticulatus, in basin pedicelliformen contractus. *Corolla* calyce cupulari duplo longior, glabra. *Annulus* staminalis in filamenta 6 apice abrupte contracta, divisus. *Fructus* immaturus tantum visus, ellipticus, utrinque acutus, circa 6 mm. longus, 4–5 mm. in diam., fossa albuminali indivisa, cylindrica.

MALAY PENINSULA: *Kemaman*, Ulu Bendong in Kajang, alt. 500 ped. (Corner, 30072–Holotypus); Sungai Nipa (Corner, s.n.).

CORNER 30072 was found mixed with some specimens of *L. malajana*. The collector notes: palm is slender solitary; leaflets dark green above, pale beneath, not glaucous; flowers greenish white; fruit fall orange-red when ripe; perianth green; staminal tube white; ovary pale orange; inflorescence hanging”.

Though this species falls into the group having simple partial inflorescences, it has no close ally in the Peninsula except the one described here as *L. Moyseyi*. In the long pedicelliform base of the calyx and its obscurely toothed apex the species may seem to appear very near to *L. Beccariana* of New Guinea but that species has been described to have very much longer flowers borne on simple and shorter spadices and belongs to the section DAMMERA.

4. *Licuala ferruginea* Becc. in Hook. f., Fl. Brit. Ind. VI (1892) 432; Ridl., Mat. II (1907) 162; Becc.

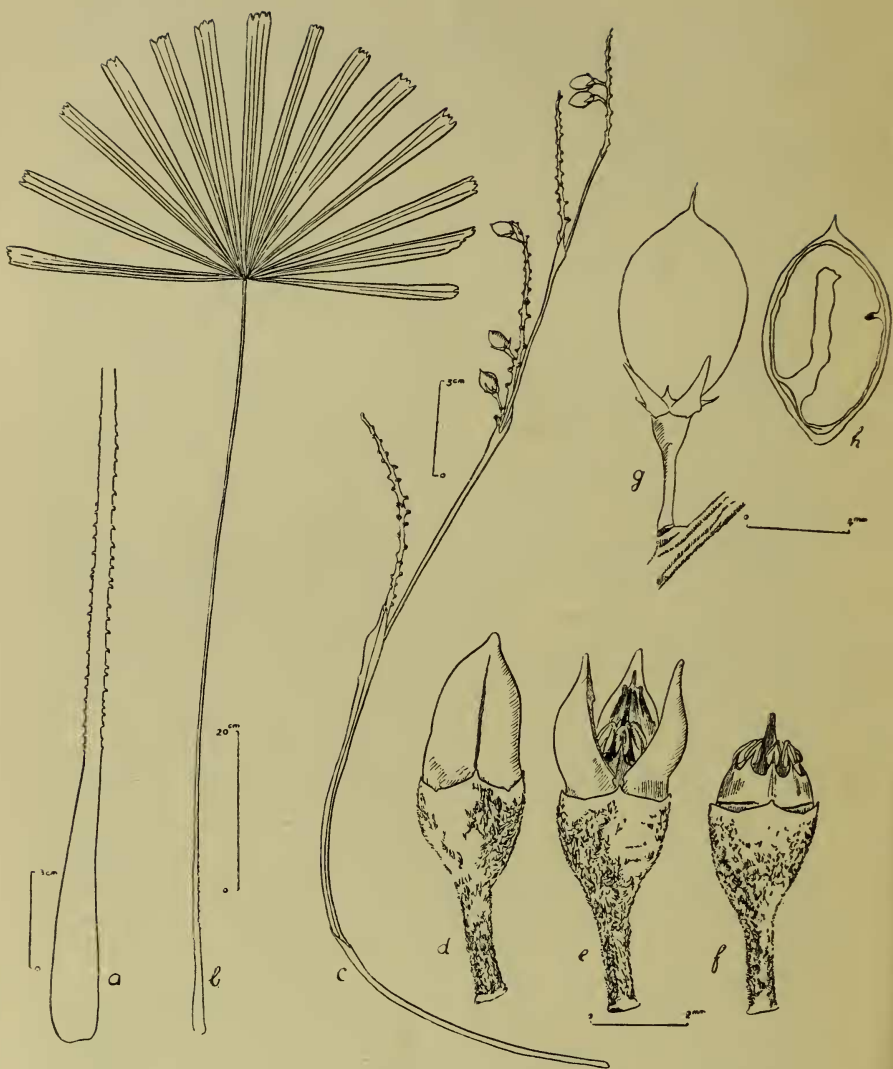


Fig. 2. *Licuala Corneri* (Holotypus: CORNER 30072).

a. Petioli pars inferior. b. Frondis lamina cum petiolo. c. Spadix fructiferus minimus. d. Alabastrum. e. Flos ad anthesin. f. Flos, corolla resecta, ut aestivatio staminum appareat. g. Fructus cum perianthio et filamentis staminum. h. Fructus verticaliter discissus, semen cum substantia integumentale oblique percurrente et embryone dorsale exhibens.

in Webbia V (1921) 32 et 46; Ridl., Flora V (1925) 26; Becc. in Calc. Annals XIII (1933) 180 tt. 9-X, 89 et 89 bis.

MALAY PENINSULA: *Kemaman* Bukit Kajang, alt. 1,000 ft. (Corner, 30398). *Pahang*, Pulau Tawar (Ridley in 1891); Bukit Sagu (Nur, 25167). *Negri Sembilan*, Ayer Kuning near Bahau (Symington, 24380). *Johore*, Sednah (Ridley, 13519); Sungai Kayu Ara (Corner, 28688); Mount Austen (Ridley in Jan. 1904); Kluang (Holttum, 9260); Gunong Belumut (Holttum, 10605); Sungai Endau (Holttum, 24944). *Singapore*, Reservoir Woods (Ridley in 1893); Bukit Timah (Ridley, 3512); Sungai Jurong (Mat in 1894); Ang Mo Kio (Ridley, 6676); Bukit Mandai (Ridley s.n.); Bukit Arang (Goodenough on 16 Nov. 1889); Botanic Gardens' Jungle (Ridley, 3168).

Distribution: Sumatra and Riow Archipelago.

From all the peninsular species having branched partial inflorescences this species is easily distinguished by the presence of the ferrugineous tomentum on spikelets and calyx and by the sessile flowers. It is distinguished from the Sumatran *L. ferruginoides* (which frequently produces branched partial inflorescences) by longer hairs on the calyx and smaller flowers.

5. *Licuala glabra* Griff. in Calc. Journ. Nat. Hist. V (1845) 329 et Palms Brit. Ind. (1850) 124 t. 233; Hook. f., Fl. Brit. Ind. VI (1892) 432; Ridl., Mat. II (1907) 161; Becc. in Webbia V (1921) 34 et 48; Ridl., Flora V (1925) 26; Becc. in Calc. Annals XIII (1933) 192 tt. 14-I fig. 1-3, et t. 82.

L. longepedunculata Ridl. in Journ. Roy. Asiatic Soc. Straits Br. XLI (1903) 42, Mat. II (1907) 161 et Flora V (1925) 26.

MALAY PENINSULA: *Peninsular Siam*, Kampong Bukit (Kiah, 24256). *Kelantan*, Kuala Betis (Henderson, 29725). *Perak*, Gunong Batu Puteh (Wray, 254—Syntype of *L. longepedunculata*). *Pahang*, Karak (Best, 13884); Gunong Tahan (Haniff & Nur, 8111); Fraser Hill (Burkill & Holttum, 7842); Tahan Woods (Ridley, in 1891). *Malacca*, Gunong Ledang (Ridley, 3473); Mount Ophir (Feilding in 1892; Derry, 633; Hullett, 852; Ridley in Dec. 1899). *Selangor*, Bukit Hitam (Kelsall in 1890; Ridley in May 1896); Bukit Kutu (Ridley 7894).

In this species there is a good deal of variation in size and robustness of the leaves, spadices, and flowers, and I agree with BECCARI in reducing *L. longepedunculata* to *L. glabra*, though the former has somewhat larger flowers than

the type of the latter. The specimen from Peninsular Siam has a somewhat pedicelliform base to the calyx, but transitions from this to the typical form are also found.

6. *Licuala glabra* Griff. var *selangorensis* Becc. in Webbia V (1921) 35 et 48; Ridl., Flora V (1925) 26; Becc. in Calc. Annals XIII (1933) 194 t. 14-I.

MALAY PENINSULA: *Trengganu*, Gunong Padang alt. circ. 2,500 ft. (Moysey & Kiah, 33399). *Pahang*, Fraser Hill, alt. 4,000–4,300 ft. (Burkill & Holttum, 8426). *Selangor*, Semangkok Pass, up to alt. circ. 3,000 ft. (Ridley in Aug. 1904; 15881, et 12117: Haptoholotype); Sempang (Ridley in April 1911). *Johore*, Kluang (Holttum, 10601).

The Trengganu specimen cited above is a more robust form than the others.

7. *Licuala kemamanensis* Furtado sp. nov. Fig. 3.

A L. ferruginoidea, cui peraffinis, palma acaulescente, frondibus minoribus, spadicebus haud flexuosis, ramis supra spathae apicem remote orientibus, floribus minoribus, bracteolis inconspicuis recedit. Facie L. Kunstleri similis, sed floribus haud conspicue pedicellati, calyce basin versus haud valde angustato, ovariis pilosis, foliis minoribus dissimilis.

Palma humilis, acaulescens. Petiolus circa 30–65 cm. longus in specimina visa, tertia parte basali aculeis remotis brevibus, 1–2.5 mm. longis armatus. Segmenta foliorum circa 14, cuneatissima, 2–6 costata, subaequalia; medianum circa 27 cm. longum, 4 cm. latum, 3–6 costatum, apice obsolete dentatum costis approximatis; intermedia mediano aequilata vel fere, paulo breviora, oblique eroso-dentata, costis 3–4 nonnihil remotis; basilaria minima, 2–3 costata, 12–14 cm. longa, 2.5–3 cm. lata, apice intermediis conformia. Spadix unicus tantum visus, haud flexuosus, 60 cm. longus, in inflorescentias partiales duas simplices, 5–8 cm. longas, ferrugineo tomentosas, supra spathae apicem remoto orientes divisus, basi cum spathis 3 involutus. Spathae fugaceo fusco-furfuraceae, tubulosae, infima bicarinata. Flores pluseriatim dispositi, solitarii, in alabastro globoso-ovati, circa 4 mm. longi; super pulvinum prominentem basi bracteolatum siti. Calyx lato campanulatus, ferrugineo-pilosus, haud striatus, ad medium in lobos 3 rotundatos divisus, basi truncatus. Corolla calyce duplo longior, striata, apice acuta, puberula. Annulus staminalis in filamenta 6 aequalia abrupte subulata divisus. Ovarium loculis saepe 3 fertilibus praeditum, minute pubescens.

MALAY PENINSULA: *Kemaman*, Sungai Nipa (Corner, 30520).

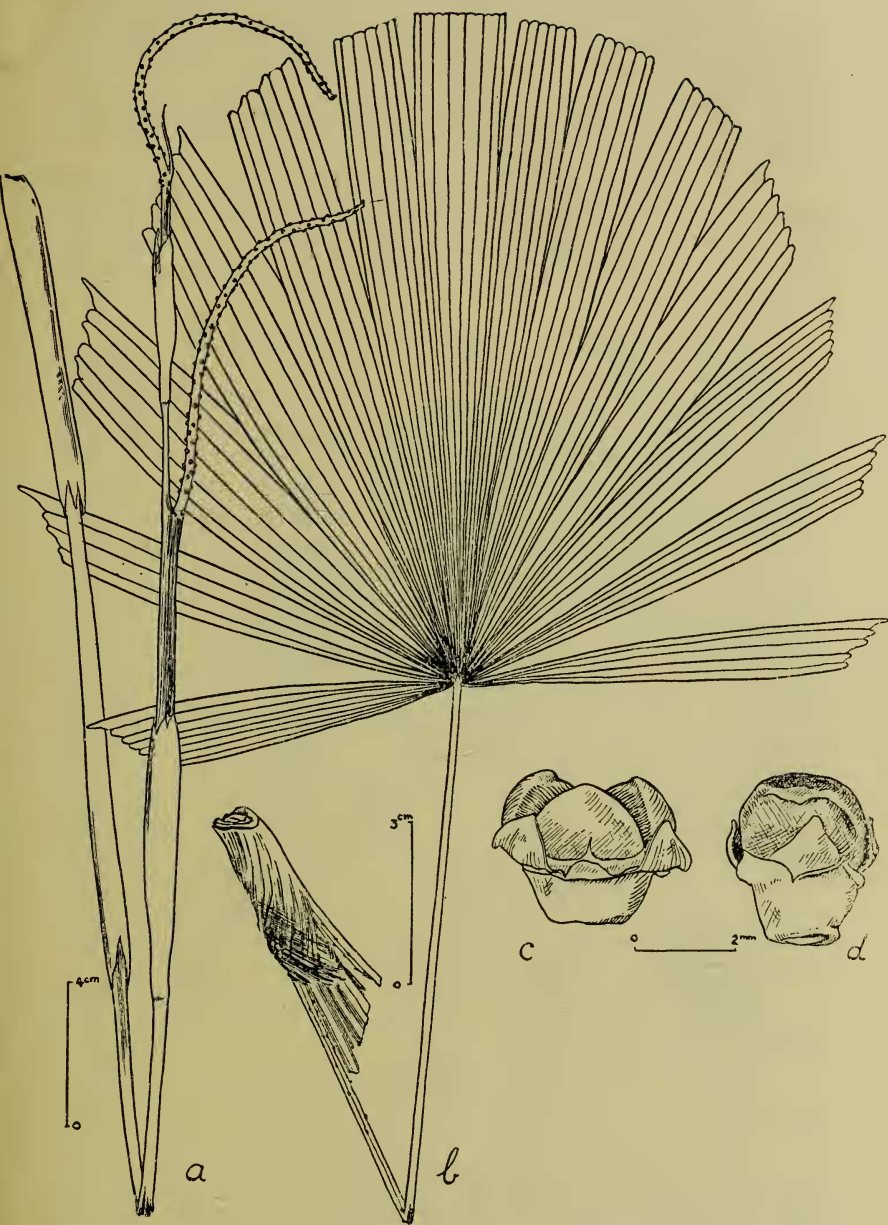


Fig. 3. *Licuala kemamanensis* (Holotypus: CORNER 30520).

a. Spadix. b. Frons. c. Flos tres carpella fertilia et unum
filamentum staminale exhibens. d. Flos cum uno carpello fertile.

This species appears to be very near to *L. ferruginoides*, a Sumatran species described to have simple partial inflorescences but known also to bear sometimes two spikelets to each spadix branch. *L. ferruginoides* is however a very tall species having much larger leaves and flowers, a zigzag axis to the spadices, the spikelets arising a little below the apex of the leaves.

The only peninsular species having simple partial inflorescences to simulate *L. kemamanensis* is *L. Kunstleri*, but the latter is readily distinguished from the former by the very long pedicels of its flowers, turbinate calyx, and glabrous ovary.

8. *Licuala Kiahii* Furtado sp. nov. Fig. 4.

Palma humilis acaulescens. *Petiolus* 60–70 cm. longus, praesertim ad basin versus rubescens, prope basin tantum spinis reduncis, remotis, 1–2 mm. longis armatus. *Segmenta* foliorum 5, rarissime 6–7, inaequalia; medianum 10–14 costatum, 20–25 cm. longum, apice 8–10 cm. latum, superficialiter obtuseque dentatum, cuneatissimum, sessile; altera 3–5 costata, mediano minora, oblique eroso-truncata, arcuato cuneata. *Spadix* petiolo duplo vel triplo brevior, basi cum pedunculo circa 20 cm. longo fusco-furfuraceo, spathis 3–4 tubulosis induto, suffultus, apice in inflorescentias partiales 2–3, simplices vel bifurcatas, furfuraceas, 3–4.5 cm. longas divisus. *Flores* in glomerulis 1–3, remotis, alterne vel spiraliter dispositi, sessiles, pulvino inconspicuo. *Calyx* furfuraceus, pubescens, in lobos acuminatos profunde partitus. *Corolla* calyce parum longior, pubescens, in lobos altos, acuminatos divisa. *Annulus* staminalis in sex filamenta abrupte subulata divisus. *Ovarium* glabrum; carpellis plerumque 1–2 vel saepius omnia evolutis. *Fructus* elongato-clavatus, saepe parum curvatus, circa 22–23 mm. longus, 3.5–4.5 mm. in diametro; semine conforme, osseo; fossa integumentali embryo dorsali supra basin objecta, apicem versus mox ascedente cylindracea.

MALAY PENINSULA: *Johore*, in collibus apud ripas Sungai Kayu (Kiah, 32137, Holotypus); in monte Gunong Pulai (Haniff, s.n., 27 Dec. 1925).

This species is very peculiar in the genus in that it has very long fruits borne on a compound spadix. The only other species known to produce such long fruits is *L. mattanensis* Becc. from Borneo, which however is characterised by many-lobed leaves, a simple, unbranched spadix having almost pedicellate flowers, and the integumental process in the seed situated on the same side as the embryo (not opposite the embryo as is the case with *L.*



Fig. 4. *Licuala Kiahii* (Holotypus: KIAH 32127).

a. Spadix. b. Planta cum spadice fructifero. c. Fructus. d. Fructus verticaliter discissus. e. Perianthium fructiferum. f. Filamentum staminale.

Kiahii). Otherwise *L. Kiahii* has many characters similar to those of *L. mattanensis*, even in the habit of developing frequently more than one fertile carpel in each ovary.

9. *Licuala Kingiana* Becc. in *Malesia* III (1889) 193; Hook. f., *Fl. Brit. Ind.* VI (1892) 434; Ridl., *Mat.* II (1907) 165; Becc. in *Webbia* V (1921) 38 et 51; Ridl., *Flora* V (1925) 30; Becc. in *Calc. Annals* XIII (1933) 213 t. 11-II.

MALAY PENINSULA: *Perak*, Bukit Kapayang (Ridley in Feb. 1904); Sungai Siput (Haniff & Nur, 6962); Gunong Keledang (Ridley, 9804); Kinta Valley (Ridley s.n.); Bujong Malacca (Curtis, 3162); Keledang Saiong (Symington, Cf. 25724 & 25612—Herb. Kepong).

The Bukit Kapayang specimen collected by RIDLEY has one spadix bifid at the apex.

10. *Licuala Kunstleri* Becc. in Hook. f., *Flor. Brit. Ind.* VI (1892) 433; Ridl., *Mat.* II (1907) 162; Becc. in *Webbia* V (1921) 30 et 44; Ridl., *Flora* V (1925) 27; Becc. in *Calc. Annals* XIII (1933) 167 t. 94.

MALAY PENINSULA: *Perak*, Temango (Ridley, 14709). *Pahang*, Tanjong Antan (Ridley in 1891); Sungai Lepar (Burkill & Haniff, 17460). *Selangor*, Ulu Gombak, alt. 1,500 ft. (Hume, 9437); Bukit Kutu (Casdani in 1899); Kuala Lumpur (Ridley in 1889); Gua Batu (Ridley in Dec. 1896).

Some specimens of this species have been distributed from Singapore under the name of *L. ferruginea*.

11. *Licuala lanuginosa* Ridl. in *Journ. Roy. Asiat. Soc. Straits Br.* 44 (1905) 203, *Mat.* II (1907) 165; Becc. in *Webbia* V (1921) 33 et 46; Ridl., *Flora* V (1925) 30; Becc. in *Calc. Annals* XIII (1933) 181 tt. 9-IV et 50.

L. longipes sensu Ridl. op. cit. (1907 and 1925) pro parte.

MALAY PENINSULA: *Johore*, Gunong Panti (Ridley in Dec. 1892; Corner 30739 & 30739A); Gunong Belumut, alt. 2,200 ft. (Holtum, 10792); Gunong Pulai (Mat in 1892; Ridley 12198 partim; Best 7711; Corner in 1937); Bukit Tinjau Laut alt. 1240 ft. (Corner 37068).

12. *Licuala longicalycata* Furtado sp. nov. Fig. 5.

L. baculariæ affinis ut videtur, sed planta robustiore, foliorum segmentis latioribus, inflorescentiæ ramulis partialis pluribus, floribus majoribus, calyce floris longe piloso, sed fructus interdum laevi, corolla minute pubescente haec species sat distincta. Inter species malayanæ L. glabra producit formas aspectu calycale similes L. longicalycatæ,

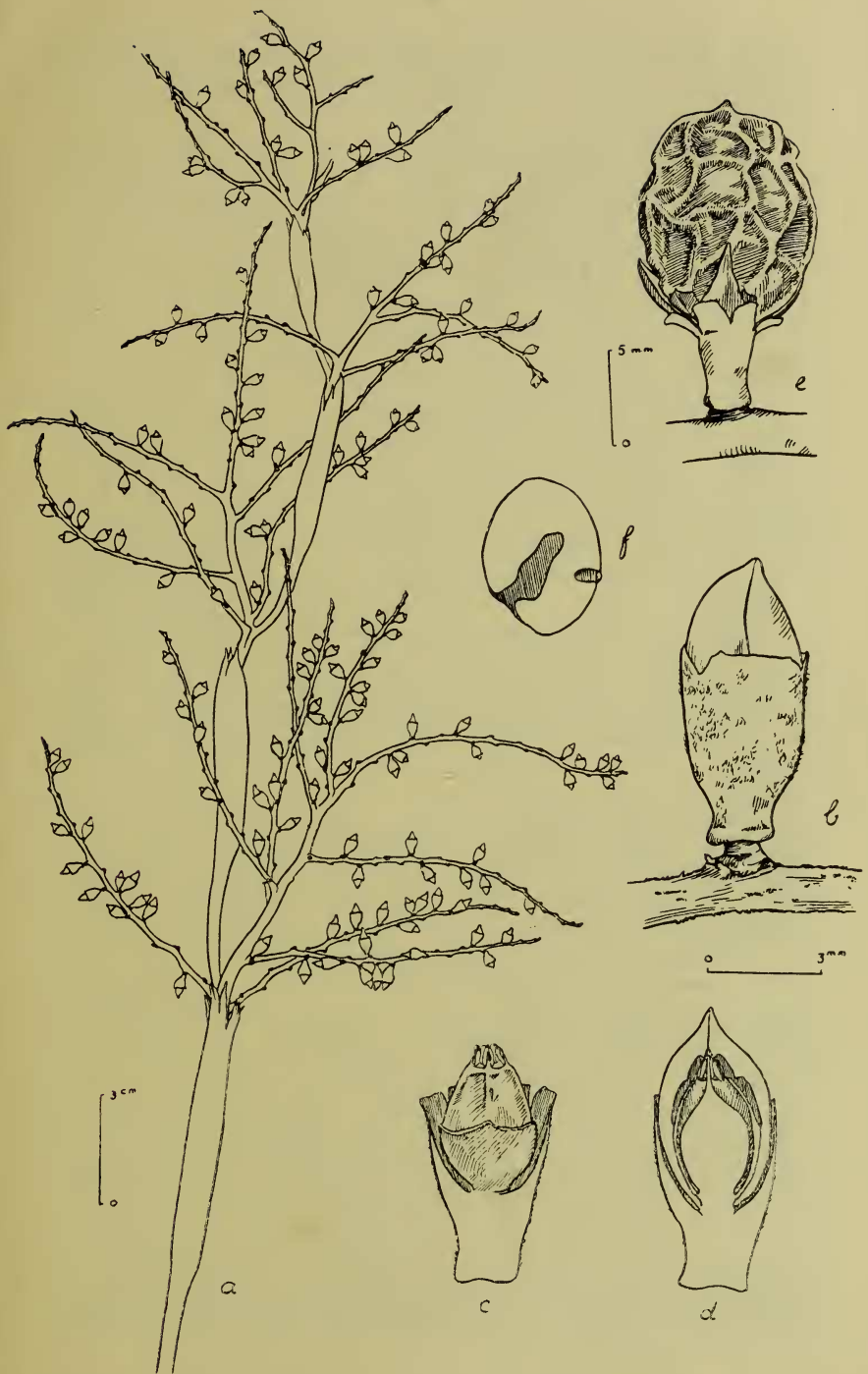


Fig. 5. *Licuala longicalycata* (Holotypus: KIAH 32401).

a. Pars spadiceis floridi. b. Alabastrum. c. Alabastrum verticaliter discissum ut aestivatio staminum appareat. d. Alabastrum verticaliter discissum ut ovarium exhibeat. e. Fructus (e specimine SYMINGTON 47092). f. Semen ejusdem fructus verticaliter discissum.

a qua illa inflorescentiæ ramulis partialis paucioribus, calyce laevi apice arcuato denticulato (haud truncato et irregulariter fisso), pulvinis floriferentibus brevioribus differt.

Caulis robustus, ad 3 m. altus. *Petiolus* longus 1–3 m. longus, tertia parte basilari aculeatus, apice circa 8 mm. latus. *Segmenta* foliorum circa 16, inaequalia, cuneatissima; centrale latissimum, pluricostatum, apice obtuse dentatum, ad 9–16 cm. latum, 40–55 cm. longum; altera angustiora, altius dentata, 3–4 costata. *Spadix* circa 70–80 cm. longus, petiolo brevior, in 4–5 inflorescentias partiales, unasquisque 5–10 ramulosas, fugaceo fusco-furfuraceas ad apicem spathæ vel paulo infra orientes, divisus, axi flexuosus. *Flores* 6–8 mm. longi, super pedicellum prominentem 1–2 glomerulati, remoti, spiraliter dispositi; in alabastro fusiformes, striati, dense fugaceo-furfuracei. *Spathæ* tubulares, fugaceo furfuraceæ, parum inflatæ, apice parce marcescentes, basilares conspicue bicarinatæ. *Calyx* 4–5.5 mm. longus, gramineus, pilis longiusculis remotis praeditus, cyathiformis, basin versus nonnihil angustatus, utrinque truncatus, apice superficialiter 3 lobatus, interdum in fructu irregulariter fissus. *Corolla* minute puberula, calyce sesqui vel duplo longior, segmentis lanceolatis, acutis, striatis, persistentibus. *Annulus* staminalis 6-fidus, lobis abrupte subulatis. *Ovarium* glabrum, gramineum, rarissime loculis fertilibus 2–3. *Fructus* in sicco oblongus, rugosus, circa 12–14 mm. longus, 10 mm. in diam; semen oblongum, 7 mm. longum, 5 mm. crassum; fossa albuminale indivisa, cylindrica.

MALAY PENINSULA: *Johore*, Sungai Kayu, in locis paludosis (Kiah, 32401, Holotypus); *Kluang* (Holttum, 9252); *Arong* (Symington, 47092–Herbarium Kepong); *Labis* (Symington, 47068–Herbarium Kepong). *Negri Sembilan*, Ayer Kuning, prope Bahau (Symington, 24379).

In BECCARI'S Key *L. longicalycata* would have to be placed near *L. paludosa* and *L. bintulensis*, from both of which it is readily distinguished by the longer calyx and the longer flower-bearing pulvini. The species also appears to be very near to *L. bacularia* which I know only from description, and which is a much smaller species having narrower leaf-segments, and more branches to the partial inflorescences. The only peninsular species which may be confused with *L. longicalycata* is *L. glabra*, especially those forms which have a longer calyx, but in the latter species the calyx is glabrous, arcuately denticulate and unlobed or unsplit, even when in fruit. The form, the colour and the pubescence of the calyx remind one of *L. modesta* and *L. tiomanensis*, both of which bear undivided partial inflorescences to the spadix. I have described the young flowers

from SYMINGTON 47068 where there is a portion of very young inflorescence mounted together with an older one; the veins and the thick furfur that is present on the flowers in bud disappear when the flowers are developed. The fruits are described from SYMINGTON 47092.

13. *Licuala longipes* Griff. in Calc. Journ. Nat. Hist. V (1845) 330 et Palms Brit. Ind. (1850) 125 tt. 234 A & B; Hook. f., Fl. Brit. Ind. VI (1892) 431; Ridl., Mat. II (1907) 162; Becc. in Webbia V (1921) 28 et 42; Ridl., Flora V (1925) 27; Becc. in Calc. Annals XIII (1933) 155 t. 8-V.

MALAY PENINSULA: *Kemaman*, Ulu Bendong, Kajang, alt. 700 ft. (Corner, 30111). *Pahang*, Titi Bungor in Temerloh (Henderson, 10559); Mentakab (Holttum, 24560). *Negri Sembilan*, Gunong Angsi (Nur, 11571; Ridley, 10121); Tampin (Burkill, 1417); Gunong Tampin (Burkill, 1171; Holttum 9557); Beremban along Sungai Bendol (Furtado, 33125). *Malacca*, Ayer Panas (Goodenough, 1406; Ridley & Goodenough, 1577); Bukit Besar Ophir (Ridley, 10120 & 3474); Selandan (Ridley, 10793); Bukit Tampin (Goodenough, 1962).

Distribution: recorded from Mergui in Lower Burma.

GRIFFITH cites the syntypes of this species thus: "Malacca, solitary in dense forests, Ayer Punnus (Rhim), Goonoong Miring, and Mount Ophir, but not above an elevation of a thousand feet. Tenasserim coast in forests near Laineur to the south of Mergui."

BECCARI found only one syntype in the Calcutta herbarium with no indication as to its locality, and since he had not seen any specimen definitely coming from the Malay Peninsula, he gave Tenasserim as the probable origin of this GRIFFITH's specimen. However from the description and the drawings given by BECCARI I think the species is common in the Peninsula, especially in the regions where GRIFFITH saw it.

From the notes given by collectors it appears that this species is very common in Malacca and Negri Sembilan; also that though it is easy to find plants in flower, it is rare to find them in fruit. There are a few specimens which have been collected above a height of 1,000 ft., and in some of these the flower-bearing pulvini are quite prominent (*e.g.* BURKILL 1171 and HOLTUM 9957); but there are transitions between these and the usual forms where the pulvini are nested in depressions.

There is some variation in the dentation of the calyx; some split very early during the development of the flowers and here the lobes are rounded at the apex and are often bifid; in others this lobation is retarded and the calyx looks

almost truncate and later split irregularly as in *L. malajana*, a species which appears to have very close affinities with *L. longipes*.

GRIFFITH records that this species is known to Malays as *Palas Batu*, a name recently recorded also by a Malay collector who notes that the leaves are used for thatching house roofs.

14. *Licuala malajana* Becc., Malesia III (1889) 197; Hook. f., Fl. Brit. Ind. VI (1892) 431; Ridl., Mat. II (1907) 161 pro parte; Becc. in Webbia V (1921) 35 et 55; Ridl., Flora V (1925) 26 pp.; Becc. in Calc. Annals XIII (1933) 196 tt. 14-IV et 87.

MALAY PENINSULA: *Trengganu*, Brang in Tersat, alt. 2,500 ft. (Kiah & Moysey, 33398). *Kemaman*, Kajang at Ulu Bendang, alt. 500 ft. (Corner, 30072 A); *Sungai Nipa* (Corner, 30547).

The following specimens have more hairy calyces, but seem to belong here:

Kelantan, Kuala Krai (Haniff & Nur, 10104). *Pahang*, Bukit Senai (Henderson, 19434). *Selangor*, Pahang Track (Ridley in 1897). *Johore*, Gunong Muntahak, alt. 600 ft. (Nur, 19968).

I have not seen any authentic specimens named by BECCARI and so my identification of the species is based entirely on the description and plates given by BECCARI. The specimens doubtfully cited here come very near to some forms of *L. modesta* which however produces very much shorter spadices bearing flowers in groups of two or three on very prominent, almost pedicelliform tubercles. The typical calyx of *L. malajana* has some resemblance to that of *L. Ridleyana*, but the latter species produces unbranched partial inflorescences.

15. *Licuala mirabilis* Furtado sp. nov. Fig. 6.

A *L. Kunstleri*, cui *peraffinis*, *spathæ limbo pedicellum axillaris spicæ plerumque valde superante*, *spathis superne inflatis, spicis (=inflorescentiis partialibus) 2-5 ramulosis haec species sat distincta*. *Secundum clavem Beccarii analyticam prope L. baculariam ponenda, a qua spadicebus quam petioli valde brevioribus facile distinguitur*.

Palma solitaria vel sobolifera, cum caule 1-1.5 m. longo 3-4 m. alta. Petiolus circa 1.5 m. longus, vagina fibrosa mox marcescente decidua præditus, in 2/3 partibus basalibus aculeis reduncis, inferioribus robustis 4 mm. altis, 1-2 mm. crassis, superioribus obscuris armatus. Segmenta frondium 20-27, basin versus valde angustata, fere petiolulata, apice 3.5-7 cm. lata, 5-15 mm. profunde dentata, 2-3, raro 4-6, costata; medianum alteris parum majus 3-6



Fig. 6. *Licuala mirabilis* (Holotypus: FURTADO 33054).

a. Pars spadiceis floridi. b. Frondis lamina cum parte petioli.
 c. Fructus. d. Semen verticaliter discissum. e. Alabastrum. f. Pulvinus cum flore dua carpella fertilia exhibente. g. Filamentum staminale.

costatum, minus profunde dentatum. *Spadices* petiolo multo breviores, ad 45 cm. longi. *Spathæ* fugaceo furfuracæ basi tubulosæ superne subito inflatæ, apice acutæ, in uno latere fissæ, partem pedicellarem spicarum axillarium plerumque superantes. *Inflorescentia partialis* in spiculas 2–5 axi pubescentes divisa, pedicello ad 2.5 cm. longo, infra limbum spathæ axillantibus plerumque oriente, sæpe quam limbus spathæ minore. *Flores* conspicue pedicellati, geminati vel solitarii. *Calyx* turbinato campanulatus, pubescens, apice membranaceus, lobatus vel partim truncatoides, in basin cylindricam induratum abrupte constrictus. *Corolla* calyce duplo longior, dense sericea. *Annulus* staminalis in filamenta 6, aequalia superne abrupte subulata. *Ovarium* glabrum. *Fructus* globosus, utrinque acutus, 10–12 mm. longus, 6–8 mm. crassus; albumine carneo, albescenti, fossa integumentale cylindrica, vertice paulo dilatata, interdum biapicali.

MALAY PENINSULA: *Kedah*, Ayer Tërjang Valley in Baling (Furtado, 33054–Holotypus); Yan (Ridley in June 1893). *Province Wellesley*, Permatang Bertam? (Ridley in 1895); Bukit Mertajam, alt. circa 450 m. (Burkill, 9021). *Perak*, Bukit Merbau Balong in Kroh (Furtado, 33037).

This species is closely allied to *L. Kunstleri*, but the branching of the partial inflorescences distinguishes them at once, *L. Kunstleri* having always simple branches to the spadices. From *L. ferruginea*, with which *L. mirabilis* has been confused, it is distinguished by the non-marcescent apex of the spathes, the pedicelled flowers and the membranous calyx having an attenuate and constricted base.

16. *Licuala modesta* Becc., Malesia III (1889) 195; Hook. f., Fl. Brit. Ind. VI (1892) 433; Ridl., Mat. II (1907) 163; Becc. in Webbia V (1921) 35 et 48; Ridl., Flora V (1925) 28; Becc. in Calc. Annals XIII (1933) 198 tt. 14–VI et 88.

L. Wrayi Becc. ex Ridl. in Journ. Roy. Asiat. Soc. Straits Br. 82 (1920) 201; Becc. in Webbia V (1921) 37 & 50; Ridl., Flora V (1925) 28; Becc. in Calc. Annals XIII (1933) 210 tt. 13–I et 46. **Syn. nov.**

MALAY PENINSULA: *Perak*, Taiping Hills (Hervey, in 1889; Ridley, 14721, in Dec. 1902 and in Feb. 1904; Furtado, 37103); Kuala Kangsar (Ridley, 3167); Gunong Hijau (Fox sub Curtis no. 3529; Burkill & Haniff, 12873 & 12589; Anderson, 164 & 171); Tea Gardens (Ridley, 11406 and in Feb. 1891); Maxwell's Hill (Burkill & Haniff, 12948, & 12551; Ridley in June 1893 & Feb. 1892; Curtis, 2077 partim, ex altera parte=*Calamus* sp.); Gunong Pondok, alt. 1,000 ft. (Henderson, 23804); Box Hill, alt. 4,200 ft. (Fox, 163); Larut Hill (Anderson, 177).

I am unable to detect any appreciable differences between the forms described by BECCARI and RIDLEY as *L. Wrayi* and *L. modesta*. The species produces very short inflorescences; in some there may be a few partial inflorescences separated by more or less elongated tubular spathes; in others the number of branches and the size of the spathes are reduced, so that the entire spadix may appear to bear directly the spikelets on its axis, though one or two liguliform spathes about 3–6 cm. in length will indicate the reduction that has taken place in the spathes; and in still others the ligule may be further reduced into small, inconspicuous bracteoles. If the definition of LICUACELLA were accepted, the specimens bearing these small bracteoles could not be kept in the subgenus that includes *L. modesta*, a reason why BECCARI was obliged to erect *L. Wrayi*.

Some of the specimens cited above were referred by RIDLEY (1907 and 1925) to *L. malajana* and to *L. pusilla*.

17. *Licuala Moyseyi* Furtado sp. nov. Fig. 7.

A *L. Corneri*, cui valde affinis, recedit haec species: petiolo inermi; segmentis frondium inaequalibus, mediano latissimo; ramulis floriferis furfuraceis, haud pubescentibus; pedicellis fere tuberculiformibus; floribus in spicis inferioribus plerumque 2–3 glomeratis; calyce fugaceo furfuraceo, haud piloso, minore, apice conspicue 3-lobato.

Petiolus gracilis, inermis, 75–90 cm. longus, ad basin circa 4 mm. latus, apice paulo angustior. *Segmenta* foliorum 8–10 dentibus 5–10 mm. altis; medianum latissimum, 10–14 costatum, 22–25 cm. longum, apice 10–15 cm. latum; altera angustiora, minora, 3–4, raro 2–5 costata; basilaria minima, apice oblique erosa. *Spadices* 60–75 cm. longi; in parte basilari haud ramosa, 35–40 cm. longa, spathis 2–3 involuti; in altera parte in ramos floriferos 3–4, simplices, fusco furfuraceos divisi. *Spathæ* tubulares, fugaceo fusco furfuraceæ, superiores obscure biangulatæ, haud inflatæ, ad 6 mm. crassæ, apice oblique truncatæ; infima latior conspicue biangulata. *Flores* in tuberculis prominentibus insidentes, 1–3 glomerati, 3–4 mm. longi, clavati. *Calyx* fugaceo fusco furfuraceus, conspicue 3-lobatus, in alabastro apice globosus, basin versus pedicelliformiter contractus. *Corolla* juvenilis tantum visa, haud pubescens. *Annulus* staminalis in filamenta aequalia abrupte subulata divisus. *Ovarium* glabrum.

MALAY PENINSULA: *Trengganu*, Gunong Padang, alt. circa 1300 m. (Kiah et Moysey, 31840).

This species may easily be confused with *L. Corneri*, for both have simple, unbranched partial inflorescences and they are the only species in the peninsula having a long pedicelliform base to the calyx. However *L. Moyseyi* can

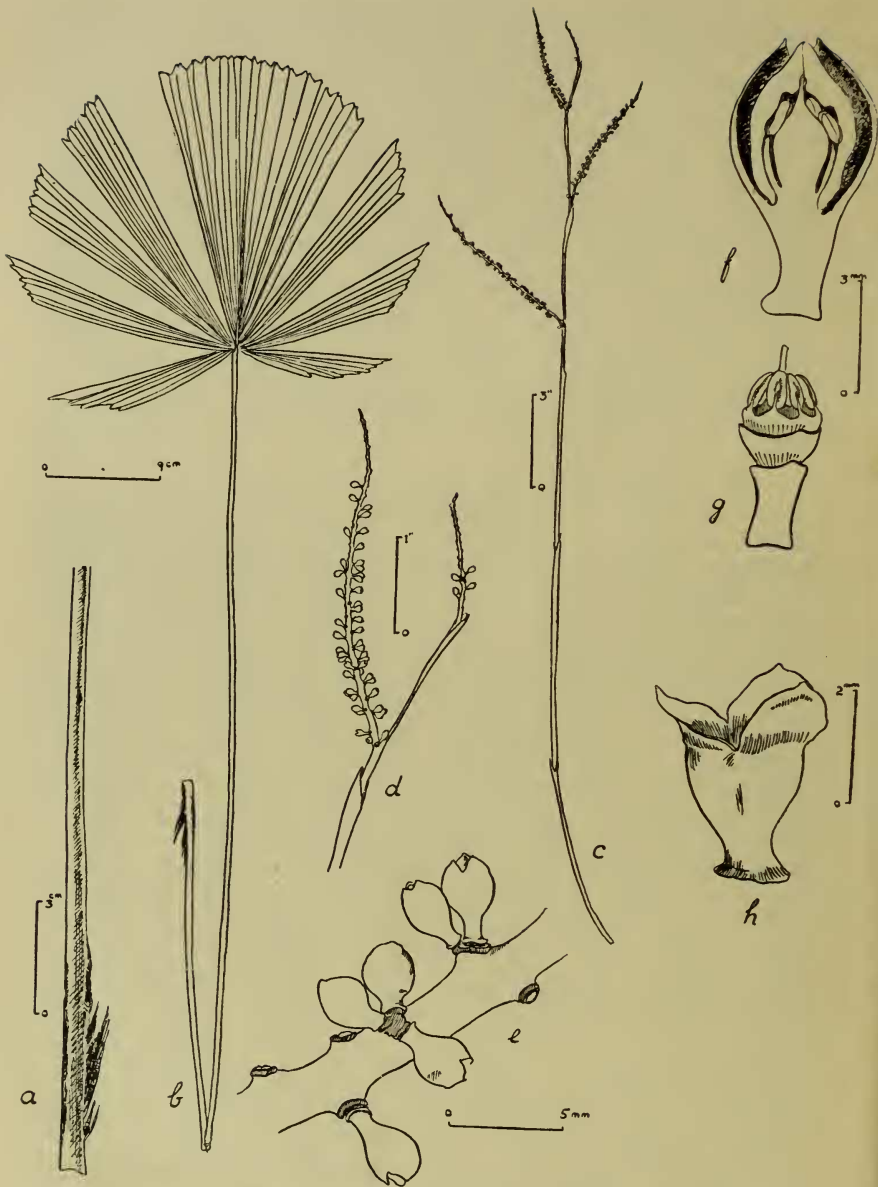


Fig. 7. *Licuala Moyseyi* (Holotypus: KIAH & MOYSEY 31840).

a. Petioli pars inferior. b. Frondis lamina cum petiolo. c. Spadix. d. Pars ejusdem apicalis. e. Pars spicae ut dispositio florum appareat. f. Alabastrum verticaliter discissum. g. Alabastrum sine perianthio ut aestivatio staminum appareat. h. Calyx fructiferus.

be distinguished from *L. Corneri* by its thornless petiole; unequal leaf-segments, the median being 2–3 times broader than the others; furfuraceous, not hairy spikelets; smaller, almost tubercular flower-pedicels; flower-glomerules consisting frequently of 3 flowers; smaller, not hairy, and distinctly 3-lobes calyx.

The flowers present in the specimen are not fully developed, the reason why the description of the petals is so meagre. One fully developed calyx was found on a spadix from which all fruits had fallen off; this calyx is represented in the drawing to show the depth of the calyx lobes.

18. *Licuala pahangensis* Furtado sp. nov. Fig. 8.

L. malajana sensu Ridl., Mat. II (1907) 161 et Flora V (1925) 26 p.p.

L. spinosa sensu Ridl. in Trans. Linn. Soc. Lond. III (1893) 391 p.p.

Inter species sapdice composito ramulis floriferis simplicibus ponenda; L. Ridleyanae et L. peninsulari valde affinis, sed calycibus striatis, glabris, apice alto lobatis, basi truncatis vertice basali caudiculatis; petalis glabris; sat distincta.

Petiolus 50–100 cm. longus, tertia parte basali aculeatus. *Segmenta* frondium subaequalia; centralia 4–6 costata, 3.5–5 cm. lata, circa 45 cm. longa, paulo latiora et minus profunde dentata alteris 2–3 costatis paulo brevioribus. *Spadices* petiolis fere aequilongi, vel eis paulo breviores, ramis simplicibus, ad 15–20 cm. longis, supra spathæ apicem remoto orientibus. *Spathæ* tubulosæ, fugaceo furfuraceæ. *Flores* solitarii, pluseriatim dispositi, circa 4–5 mm. longi. *Calyx* membranaceus, valde striatus, glaber, apice in 3 lobos asymmetros divisus interdum irregulariter fissus, basi truncatus vertice caudiculatus. *Corolla* glaber, calyce duplo longior. *Annulus* staminalis in filamenta versus apicem arcuatim angustata divisus. *Ovarium* glabrum, loculis saepe duobus vel tribus fertilibus. *Fructus* maturus ignotus.

MALAY PENINSULA: *Pahang*, ad radicem montis Gunong Senyum (Henderson, 22305–Holotypus); Titi Bungor, Temerloh (Henderson, 10623); Tanjong Antan (Ridley in 1891); Pulau Chengai (Ridley in 1891).

From the species bearing simple spadix-branches *L. pahangensis* is readily distinguished by the striate, glabrous calyx which is deeply lobed at the apex and truncate at the base, where it has a small tail-like projection. Otherwise this species may be easily confused with *L. peninsularis* and *L. Ridleyana*.

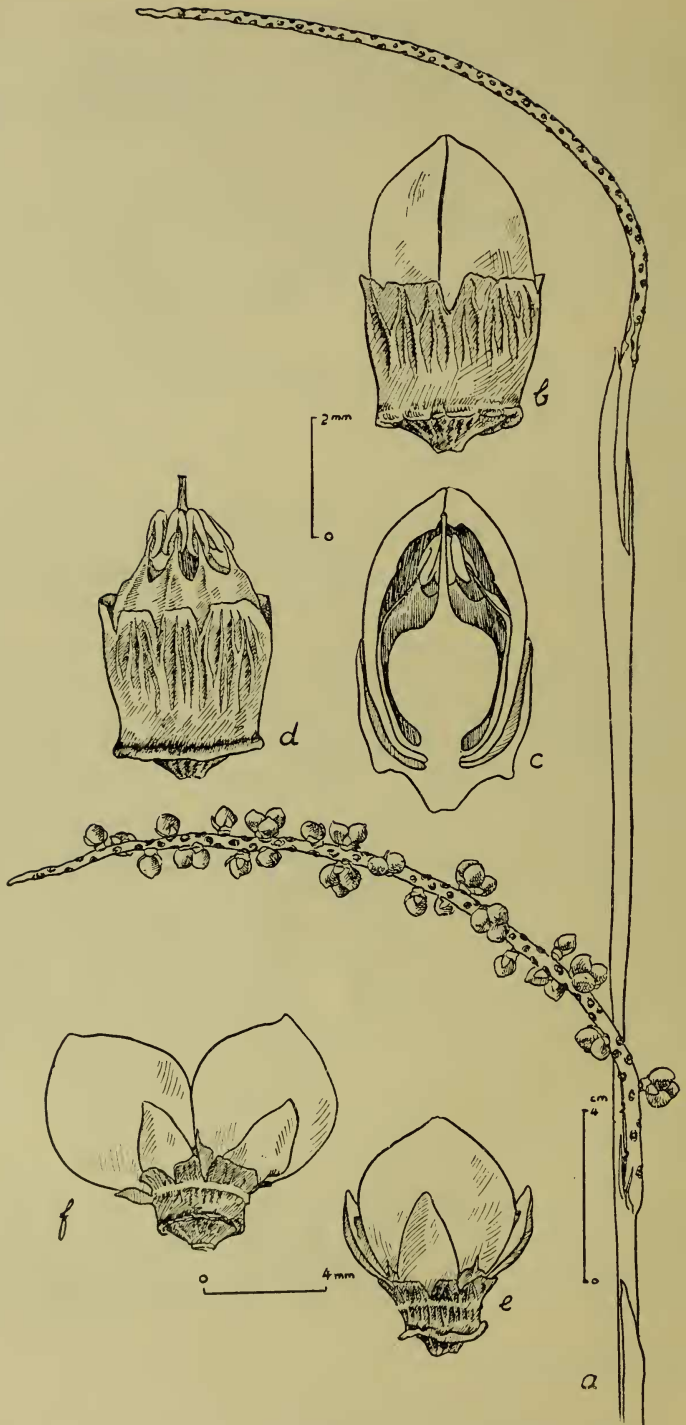


Fig. 8. *Licuala pahangensis* (Holotypus: HENDERSON 22305).

a. Pars spadiceis. b. Alabastrum. c. Alabastrum verticaliter discissum. d. Alabastrum, petala resecta, ut aestivatio staminalis apparet. e. Fructus immaturus monospermus. f. Fructus immaturus

19. *Licuala paludosa* Griff. in Calc. Journ. Nat. Hist. V (1843) 233 et Palms Brit. Ind. (1850) 118 tt. 221 A, B, et C; Hook. f., Fl. Brit. Ind. VI (1892) 430; Ridl., Mat. II (1907) 160 p.p.; Becc. in Webbia V (1921) 24 et 43; Ridl., Flora V (1925) 25 p.p.; Becc. in Calc. Annals XIII (1933) 159 tt. 8–XI, et 98.

L. paniculata Ridl. in Journ. Roy. Asiat. Soc. Straits Br. XLI (1903) 42, et Mat. II (1907) 163; Becc. in Webbia V (1921) 29 et 43; Ridl., Flora V (1925) 30; Becc. in Calc. Annals XIII (1933) 161 tt. 10–I et 46. **Syn. nov.**

L. patens Ridl. in Journ. Roy. Asiat. Soc. Straits Br. LXXXII (1920) 202 et Flora V (1925) 25. **Syn. nov.**

L. spinosa sensu Ridl. in Kew Bull. (1926) 91.

MALAY PENINSULA: *Perak*, Hermitage Hill (Ridley in 1892, Holotype of *L. paniculata*); Sungai Krian Estate, alt. sea level (Spare, 33288); Gunong Bubu alt. 4,000 ft. (Wray, 3928, Haptosyntype of *L. patens*). *Selangor*, Sungai Tinggi, near Kuala Selangor (Nur, 34076). *Johore*, Hadji Senawi (Ridley, 11212).

SUMATRA, Siberut in Mentawi Islands (Boden-Kloss, 14614).

Distribution: Borneo and Indo-China.

RIDLEY has referred to this species many specimens of *L. spinosa*. Perhaps he had these specimens in mind when he erected *L. patens*.

L. paludosa is easily distinguished from *L. spinosa* by its calyx being minutely puberulous or almost glabrous outside and irregularly and shortly lobed at the apex. I do not find any important difference between the specimens collected in the lowlands and those collected in the mountains, and so I have reduced *L. patens* to a synonym of *L. paludosa*. There are some small differences noticeable between the types of *L. paniculata* and *L. paludosa*, but there are transitions; but even without these transitions the differences are so trivial that I have no hesitation in reducing *L. paniculata* to *L. paludosa*. (These differences have been noticed by BECCARI in Calcutta Annals *l.c.*).

In erecting *L. paniculata* (1903) RIDLEY remarked that it and *L. penduliflora* from New Guinea were the only species known to him to have a "panicked" inflorescence, which, according to him, characterise the section PERICYCLA. Since he did not include in this section *L. paludosa*, *L. longipes* and *L. patens*, even in his most recent work (1925), it is not easy to understand RIDLEY's conception of the section PERICYCLA (sometimes spelt by RIDLEY as *Pericyclus*).

BECCARI has reduced *L. amplifrons* Miq. to *L. paludosa*, but the specimens growing under that name in the Botanic Gardens, Buitenzorg, Java, appear to be different, though BECCARI quoted material from these plants under *L. paludosa*. In 1936 I collected herbarium material from these plants in Buitenzorg and distributed it under the Singapore Field no. 31102 and 31129. The plants can be distinguished from the typical *L. paludosa* in being solitary, bearing shorter petioles, fewer branches to partial inflorescences, longer flower-bearing pulvini, and sometimes the flowers borne in pairs on each pulvinus. The material looks so different that a further inquiry into the status of *L. amplifrons* Miq. seems to be necessary.

20. *Licuala pusilla* Becc., Malesia III (1889) 194; Hook. f., Fl. Brit. Ind. VI (1892) 433; Ridl., Mat. II (1907) 164; Becc. in Webbia V (1921) 31 et 45; Ridl., Flora V (1925) 28; Becc. in Calc. Annals XIII (1933) 174 t. 85.

L. acutifida sensu Ridl. op. cit. (1907) 163 et (1925) 27. p. parte.

MALAY PENINSULA: *Kelantan*, Gua Ninek (Henderson, 19686). *Selangor*, Rantau Panjang (Hume 7619; Ridley in Aug. 1909); Kanching (Foxworthy and Burkill on 30 Nov. 1921). *Negri Sembilan*, Gunong Angsi (Ridley in Feb. 1904). *Malacca*, Sungai Udang (Goodenough, 1360 as Palas Padi).

Of this species I have not seen any specimens named by BECCARI, and so my identification of it is based entirely on BECCARI's description and plate. The young floriferous branches are covered with whitish tomentum.

This species appears to be very near to *L. triphylla* some forms of which bear many, narrow almost linear segments to the leaves, the median lobe being sessile. Further investigation in the field may prove *L. pusilla* to be only a form or variety of *L. triphylla*.

21. *Licuala Ridleyana* Becc. in Webbia V (1921) 31 et 44 et in Calc. Annals XIII (1933) 170 tt. 10-III et 34.

L. malajana sensu Ridl., Mat. II (1907) 161 et Flora V (1925) 26 p.p.

MALAY PENINSULA: *Perak*, Bujong Malacca (Ridley, 9805, et 9806, Haptoparatype of *L. acutifida* var. *peninsularis*).

From the description and drawings given by BECCARI and from the Singapore duplicates of the specimens cited by BECCARI, the flowers of the specimens cited under *L. Ridleyana* and *L. acutifida* var. *peninsularis* (see *L. confusa*) appear to have been interchanged either by RIDLEY at the

time of distributing his collections or by BECCARI at the time of drafting his description. In the Singapore herbarium spadices of RIDLEY 9806 (cited by BECCARI under *L. acutifida* var. *peninsularis*) and RIDLEY 14112 (Haptoholotype of *L. Ridleyana*) still bear flowers; but RIDLEY 9806 has flowers depicted for *L. Ridleyana* and RIDLEY 14112 has flowers depicted for *L. acutifida* var. *peninsularis*. As I have typified the species on the characters of flowers, which are more stable and of better diagnostic value than the characters of leaves, spathes, etc., investigators should note these points in case discrepancies be noticed in the original specimens of these two taxonomic units.

As described by BECCARI, *L. Ridleyana* approaches very near to *L. malajana* which has however branched partial inflorescences. (see also observations under *L. confusa*).

22. *Licuala Scortechinii* Becc., Malesia III (1889) 192; Hook. f., Fl. Brit. Ind. VI (1892) 434; Ridl., Mat. II (1907) 164; Becc. in Webbia V (1921) 37 et 49; Ridl., Flora V (1925) 30; Becc. in Calc. Annals XIII (1933) 208 tt. 13-IV, 59 et 59 bis.

MALAY PENINSULA: *Kedah*, Gunong Jerai =Kedah Peak (Haniff in May 1904; Ridley, 5201; Robinson and Kloss, 6016).

This species was based on a specimen collected by SCORTECHINI in Perak where it has not been found again.

23. *Licuala spinosa* Wurm in Verh. Bat. Genootsch. II (1780) 469; Bl., Rumphia II (1844 ?) 39 tt 82 et 88; Hook. f., Fl. Brit. Ind. VI (1892) 431; Ridl., Mat. II (1907) 160; Becc. in Webbia V (1921) 34 et 47; Ridl., Flora V (1925) 25; Becc. in Calc. Annals XIII (1933) 186 t. 84.

MALAY PENINSULA: *Perlis*, Mata Ayer (Henderson, 23061). *Kelantan*, Sungai Keteh (Nur, 12077). *Lankawi*, common (Curtis, 2129); Coah (Curtis, 3419). *Pahang*, Pekan (Ridley on Aug. 20, 1889); Tasek Bera (Henderson, 24433); Pulau Tioman (Nur, 18901; Burkill in June 1915). *Perak*, Dindings (Ridley, 3170); Matang Jambu (Wray, 2527). *Malacca*, Bukit Bruang (Hassan, 25). *Johore*, Sungai Segal in Muar (Fox, 11303); Sungai Rhu (Corner, 28485); Sungai Sedili in Mawai (Holttum & Corner, on 16 May 1932); Pulau Tinggi (Feilding in 1892). *Singapore*, Pulau Ubin (Ridley, 5121 et 3166; Hullett on 9 Nov. 1884); Pulau Battam (Ridley in 1890 and in 1891); Pulau Brani (Ridley in 1900); Changi (Ridley in April 1889).

Distribution: Lower Burma, Siam, Indo-China, Andamans, Sumatra, Java, Borneo, and the Philippines.

24. *Licuala tiomanensis* Furtado sp. nov. Fig. 9.

Inter species inflorescentias partiales simplices gerentes calyce majore superficialiter lobato dense adpresse piloso sat distincta. Facie florum L. modestæ similis, sed spadicebus longioribus, inflorescentiis partialibus remotioribus simplicibus dissimilis.

Palma humilis. Petiolus unicus tantum visus, 22 cm. longus, infra medium aculeatus. Segmenta foliorum multa, inaequalia, cuneata; medianum maximum, circa 28 cm. longum, 9 cm. latum, pluricostatum; basilaria 2—costata, minima, 15—17 cm. longa, circa 2 cm. lata; intermedia 3—4 costata. Spadix circa 80 cm. longus, in ramos 2—3, pilosos, simplices, infra spathæ apicem orientes divisus. Spathæ tubulosæ, fugaceo-furfuraceæ. Flores immaturi lanceolati, 6—8 mm. longi, super pulvinos prominulos plerumque geminati. Calyx 4 mm. longus, dense pilosus, apice truncatus, breviter lobatus vel in 3 lobos obscure fissus. Corolla ante anthesin calyce 1/3 longior, puberula, lobis acutis. Annulus staminalis conspicuus, in 6 filamenta abrupte subulata divisus. Ovarium glabrum.

MALAY PENINSULA: *Pahang*, Bukit Kajang in insula Tioman, alt. 3,300 ped. (Nur, 18611).

This species resembles *L. Ridleyana*, *L. peninsularis*, etc. in having simple branches to the spadix, but in the characters of the flowers it is easily confused with *L. modesta*. Unfortunately *L. tiomanensis* is known only from a single specimen containing only one leaf which may not be typical of the species. Fruits are not known.

NUR, 18910 collected also on Gunong Kajang in Pulau Tioman at an alt. 2,500 ft. seems to belong here, but no flowers are present in the Singapore herbarium, though from the collector's notes it appears that the flowers were present in the collection. The petiole is very much longer in this specimen and may have been over 3½ feet long; the partial inflorescences arise very high above the apex of the spathes. The collector notes that the plant which supplied this specimen is 15—20 feet in height.

25. *Licuala triphylla* Griff. in Calc. Journ. Nat. Hist. V (1845) 332 et Palms Brit. Ind. (1850) 126 t. 225; Hook. f., Fl. Brit. Ind. VI (1892) 432; Ridl., Mat. II (1907) 163; Becc. in Webbia V (1921) 33 et 46; Ridl., Flora V (1925) 28 t. 211; Becc. in Calc. Annals XIII (1933) 182 tt. 9—V et 96.

L. pygmaea Merr. in Univ. Calif. Publ. Bot. XV (1929)

20. Syn. nov.

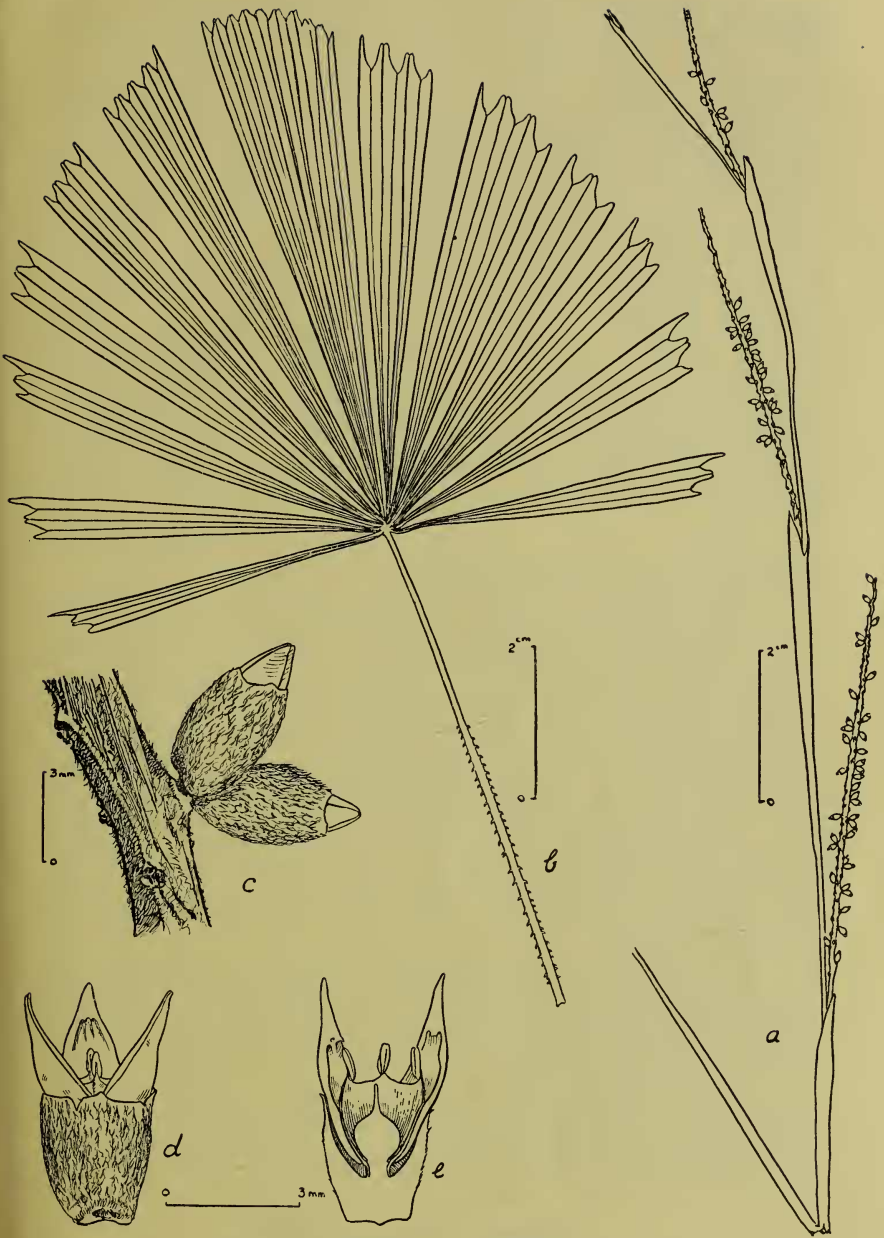


Fig. 9. *Licuala tiomanensis* (Holotypus: NUR 18611).

a. Pars spadicea. b. Frondis lamina cum parte petioli. c. Pars spicae cum alabastris. d. Flos ad anthesin. e. Flos verticaliter discissus ut filamenta staminum et ovarium appareant.

L. triphylla var. *integrifolia* Ridl., Mat. II (1907) 164; Becc. in Webbia V (1921) 33 et 46; Ridl., Flora V (1925) 28; Becc. in Calc. Annals XIII (1933) 184. **Syn. nov.**

MALAY PENINSULA: *Kedah*, Bukit Seblak at Weng (Furtado, 33069). *Pahang*, Gunong Senyum (Henderson, 22356); Batu Talam near Raub (Burkill & Haniff, 16959); Lubo Pellang (Ridley in 1891, the holotype of the var. *integrifolia*); Pulau Tijou (Ridley in 1891); Dong near Raub (Burkill & Haniff, 16911). *Perak*, Kroh (Furtado, 33041); Bujong Malacca (Curtis in Aug. 1898); Gunong Tungul in Dindings (Ridley in May, 1896 and July 1898). *Negri Sembilan*, Tampin (Burkill, 3212; Nur 1308). *Malacca*, Chabau (Alvins, 2306 as Palas Revang); Ayer Panas (Ridley & Goodenough, 1628); Malacca Town (Alvins, 655, as Gurcheng or Palas Tikus); Bukit Bruang (Curtis, in May 1901). *Johore*, Sungai Tebrau (Ridley, 13234); Bukit Keara in Muar (Fox, 11301; Ridley in 1902); Sungai Buloh Kasap (Corner on 5 Jan. 1936); Bukit Tinjau Laut (Corner, 37079). *Singapore*, Changi (Ridley in 1891 & 1894).

BRITISH NORTH BORNEO: Tawao (Elmer, 21635, Haptosyntype of *L. pygmaea*).

Distribution: Bangka (?) *fide* Beccari.

L. triphylla is a very variable species as regards the number of the leaf segments and the size of the petiolule of the median segment, some median segments being quite sessile. Owing to these variations field studies are necessary to see whether *L. pusilla* is a special form of this species. *L. triphylla* flowers when the plants are very small, so that leaves showing no divisions or leaves partially divided into 2 or 3 lobes may be found. In the holotype of *L. triphylla* var. *integrifolia* some leaves have very narrow segments at the base; these have been ignored by RIDLEY in describing the variety. Transitions from this to many-segmented leaves are many.

Many leaves bear sessile median segments, so that this cannot be taken as an invariable character of the species. GRIFFITH'S plate depicts leaves with sessile median lobes and so also RIDLEY'S figure which appears to have been based mainly on GRIFFITH'S plate.

I cannot separate *L. pygmaea* from *L. triphylla* on any characters. The median segment in the duplicate specimen in Singapore shows a distinct tendency to petiolulation.

6. Summary and Conclusions

This paper contains the results of a study of the *Licuala* species indigenous in the Malay Peninsula.

Though *Licualas* present little difficulty for collecting herbarium specimens, yet they are not well represented in the herbarium. The principal reason for this is that some experience is required before the collector is able to distinguish between the different species he meets with in the field, and so very often rare species, being mistaken for the common ones, are omitted in the collection. Hence some hints are given in this paper to enable the collector to distinguish readily between the species of a given area.

An inquiry into the affinities of the Malayan species revealed the necessity of revising the subdivisions of the genus. The previous subdivisions were mostly based on the branching of the spadices, a character very variable and therefore unsatisfactory for the purpose. It has been found also that all *Licuala* species produce a dorsal embryo in the fruit so that the definition that PERICYCLA includes species with basal embryo is untenable. The only stable character which can be employed to place allied species into large groups is found in the andræcium, and in the nature of its divisions.

As revised here, the genus *Licuala* consists of three subgenera: LIBERICULA (new), EU-LICUALA and PERICYCLA, the second subgenus being again subdivided into four sections: WURMBIA (new), BONIA (new), BECCARIA (new) and DAMMERA (new state). The subgenus LIBERICULA and the sections BONIA and BECCARIA are monospecific, containing respectively: *L. peltata* (in monsoon forests in North-East India, Assam, Burma, Andamans and Thailand (Siam)), *L. fatua* (Indo-China) and *L. reptans* (Borneo). Of the section DAMMERA only two species are known, both from New Guinea. The subgenus PERICYCLA has been re-defined to include all the species which are allied to *L. penduliflora* (Bl.) Miq., the type of the subgenus; these inhabit the tropical and sub-tropical regions in Oceania, one occurring in Australia, a few in the small islands west of the Solomon Islands, and the rest in New Guinea. The section WURMBIA includes the great majority of the *Licuala* species, the greatest number of these being limited to the Malay Peninsula, Sumatra and Borneo, though some also occur outside this region in Burma, Indo-China, South China, Java, Philippines, Celebes and New Guinea. Usually the distribution of the individual species of this section is very limited; *L. spinosa*, the type of the section, is the most widespread, being also of a frequent occurrence throughout the Malay Peninsula.

There are in all twenty-five species indigenous in the Malay Peninsula. Of these *L. peltata* is the only species that is not a member of WURMBIA. Besides *L. peltata* and

L. spinosa, four peninsular species are known or reported to occur wild outside the Malay Peninsula, namely *L. ferruginea*, *L. longipes*, *L. paludosa* and *L. triphylla*; they are also fairly widespread within the Peninsula itself. The other nineteen are all endemic, most of them being apparently restricted to small regions in the Peninsula. Much of this endemism may be more apparent than real, because, owing to the difficulty of distinguishing *Licualas* in the field, the species are not well represented in the collections. Furthermore, recent collections from Sumatra, Borneo, and Siam have not yet been worked out.

The new name *L. Beccariana* has been proposed for the New Guinea species, previously known as *L. racemosa* Becc. (DAMMERA), non *L. racemosa* Bl. (WURMBIA). In addition nine new species have been described from the Malay Peninsula: *L. confusa*, *L. Corneri*, *L. kemamanensis*, *L. Kiahii*, *L. longicalycata*, *L. mirabilis*, *L. Moyseyi*, *L. pahangensis*, and *L. tiomanensis*.

The following names have been reduced in the synonymy: *L. acutifida* var. *peninsularis* (*L. confusa*, doubtful), *L. longepedunculata* (*L. glabra*), *L. paniculata* and *L. patens* (*L. paludosa*), *L. pygmaea* (*L. triphylla*), *L. racemosa* Becc., non Bl. (*L. Beccariana*), *L. triphylla* var. *integrifolia* (*L. triphylla*) and *L. Wrayi* (*L. modesta*).

It has been shown that *L. ferruginoides* produces at times branched partial inflorescences (vide observ. sub. *L. ferruginea*) and that a further inquiry is needed before Beccari's reduction of *L. amplifrons* to *L. paludosa* can be accepted as final.

7. Index to the Collector's Numbers

Alvins: 655 & 2306(25). Anderson: 164(16); 171 & 177(16). Best: 7711(11); 13884(5). Boden-Kloss: 14614(19). Burkill: 1171 & 1417(13); 3212(25); 9021(15). Burkill & Haniff: 12551 & 12589(16); 12873 & 12948(16); 16911 & 16959(25); 17460(10). Burkill & Holttum: 7842(5); 8426(6). Corner: 28485(23); 28688(4); 30072(3); 30072A(14); 30111(13); 30398(4); 30520(7); 30547(14); 30739(11); 37068(11); 37079(25). Curtis: 1010(1); 2077(16); 2129(23); 3162(9); 3419(23). Derry: 633(5). Elmer: 21635(25). Fox: 163(16); 3529(16); 11301(25); 11303(23). Furtado: 33037 & 33054(15); 33069(25); 33125(13); 37103(16). Goodenough: 1360(20); 1406(13); 1962(13). Haniff & Nur: 4720(A); 6962(9); 8111(5); 10104(14). Hassan: 25(23). Henderson: 10559(13); 10623(18); 19434(14); 19686(20); 22305(18). 22356(25); 23061(23); 23804(16); 24433(23);

29725(5); 33041(25). **Holttum**: 9252(12); 9260(4); 9557(13); 10601(16); 10605(4); 10792(11); 24560(13); 24944(4). **Hullett**: 852(5). **Hume**: 7619(20); 7962(2); 9437(10). **Kiah**: 24256(5); 32137(8); 32401(12). **Kiah & Moysey**: 31840(17); 33398(14); 33399(6). **Kloss**: see **Boden-Kloss**. **Lobb**: 280(1). **Moysey**: see **Kiah & Moysey**. **Nur**: 1308(25); 11571(13); 12077(23); 18611(24); 18901(23); 18910(24 obs.); 19968(14); 25167(4); 34076(19). **Ridley**: 3166(23); 3167(16); 3168(4); 3170(23); 3473(5); 3474(13); 3512(4); 5121(23); 5201(22); 6676(4); 7894(5); 9804(9); 9805(21); 9806(21) 10120(13); 10121(13); 10239(2 obs.); 10329(2 obs.); 10793(13); 11212(19); 11406(16); 12117(6); 12198(11); 13234(25); 13519(4); 14112(2); 14709(10); 14721(16); 15881(6). **Ridley & Goodenough**: 1577(13); 1628(25). **Robinson & Kloss**: 6016(22). **Spare**: 33288(19). **Symington**: 24379(12); 24380(4); 25612(9); 25724(9); 47068(12); 47092(12).

8. Index to the Botanical Names

Sectional and Subgeneric names in small CAPITALS. New names in bold faced type. Synonyms in *italics*.

BECCARIA

BONIA

DAMMERA tr. nov.

DAMMERA subg.

EU-LICUALA

LIBERICULA

LICUACELLA

Licuala:

acutifida

acutifida var. *peninsularis*
(obs.)

amplifrons (obs.)

Beccariana nom. nov. (gen.)

confusa sp. nov.

Corneri sp. nov.

ferruginea

ferruginoides (obs.)

glabra

glabra var. *selangorensis*

grandis (gen.)

kemamanensis sp. nov.

Kiahii sp.n.

Kingiana

Kunstleri

lanuginosa

longepedunculata

longicalycata sp.n.

malajana

Licuala:

mirabilis sp.n.

modesta

Moyseyi sp.n.

pahangensis sp.n.

paludosa

paniculata

patens

peltata

pusilla

pygmaea

racemosa (gen.)

Ridleyana (obs.)

Rumphii (gen.)

Scortechinii

spinosa

tiomanensis sp.n.

triphylla

triphylla var. *integrifolia*

Wrayi

LICUALINA

LICUALOPSIS

Pericycla emend. (obs.)

PERICYCLA

WURMBIA